CAR AND LOCOMOTIVE OUTPUT IN 1904.

Returns received from practically every car building plant in the country show that approximately 62,950 cars have been built, including cars for use on elevated railroads, but exclusive of street and other electric cars. These figures, of course, do not include cars built by the railroads at their own shops. Of the above total, approximately 60,806 are for freight service and 2,144 for passenger service; 60,955 are for domestic use, and 1,995 are for export. All the figures this year are official, except in the case of one of the smaller equipment firms where it was necessary to make an estimate from our own current records, so that the sum total as given here may be accepted as very nearly correct. This is the smallest car output since 1897, when 43,588 cars were built. Business conditions looked very uncertain, at this time a year ago, with gross earnings falling off rapidly, while operating costs continued to grow higher; and in view of the recent large equipment purchases, beginning in 1898 with more than double the 1897 output, and continuing to increase until the high-water mark of 164,547 cars was reached, in 1902, it was wholly to have been expected that retrenchment would show first of all in equipment orders. A large amount of old rolling stock was overhauled and put into service at the railroad shops, supplying current needs in more or less temporary fashion, and it is only since the early part of the fall that new orders have been coming in rapidly. During the past three months, over 70,000 cars have been ordered; some ten per cent. more than the total output for the year. The majority of these are for delivery in the early part of 1905. During the year, 1,942 cars were built by three firms in Canada. The following table shows our estimates for cars built during the past six years:

	Freight cars.	Passenger coaches.	Total.
1899.....	119,886	1,305	121,191
1900.....	115,631	1,636	117,267
1901.....	136,950	2,055	139,005
1902.....	162,599	1,948	164,547
1903.....	153,195	2,007	154,808
1904.....	60,806	2,144	62,950

During the year, 3,441 locomotives were built at the various locomotive plants in the country, as against 5,152 last year. This figure is officially correct and required no estimating. The number for the current year includes 95 electric locomotives. These figures do not include locomotives built by the railroads at their own shops nor orders given for repairs. It is interesting to note in this latter connection that during the past year an order was given by one of the leading railroads in the country to one of the largest locomotive builders for the repair of 600 locomotives. The following table shows our figures for locomotive building for the past thirteen years:

1892.....	2,012	1899.....	2,473
1893.....	2,011	1900.....	3,153
1894.....	695	1901.....	3,384
1895.....	1,101	1902.....	4,070
1896.....	1,175	1903.....	5,152
1897.....	1,251	1904.....	3,441
1898.....	1,875		

COMPULSORY BLOCK SIGNALING.

In the contributors' column, Colonel Prout makes a strong statement of the arguments against Federal requirement of block signals. He believes that it would be an invasion of states' rights if Congress should compel the use of the signals, and hence that such a measure would be unconstitutional; that until the state government breaks down the Federal government has no right to interfere. With regard to the proposal that the enactment should be made by the states individually, he asks where the thing is to stop if the state begins the protection of people on the railroads; whether this protection should not logically include the control of interlocking and of permanent way and structures, and why it should stop short of protecting railroads against trespassers and trespassers against themselves. The *Railroad Gazette* in the past has always maintained, and now continues to maintain, that extension of the central government authority is a highly dangerous thing. It opposes flatly the efforts of the Interstate Commerce Commission to place the rate making power in the hands of the government, and it fully believes that the solution of the many important problems in the harmonizing and efficient conduct of the American railroad system will come through intelligent corporate initiative, and not through government control. But while the harmonizing of the elements which go to make up perfection is in progress, too many lives are being lost. As a preventive of collisions—the most tangible and the most curable of all fatal railroad accidents at the present time—the block system stands above all other safety measures, both in efficiency, and in the relative ease and quickness with which it can be made effective. But no reader of the *Railroad Gazette* needs a sermon on the merits of the block system.

If it is granted that the establishment of a system by which trains are protected by a definite space interval is likely to reduce the loss of life by tending to do away with a particularly common and particularly fatal kind of accident, then it is highly important that this system should be found at least on all passenger lines that are of any consequence, as soon as possible. But the manager or the superintendent who believes in all sincerity that such improvements as this are sure to work for genuine economy cannot always get his appropriation when he wants it, if indeed he can get it at all. From the standpoint of railroading then, legislation of the kind indicated would in the first place save lives, and in the second place would strengthen the hands of the operating man in placing blocking at the head of the appropriation list instead of at or near the bottom of it.

But the objections raised by Colonel Prout are based rather on constitutional than on operating grounds. He points out that the salient difference in requiring a standard type of brake or coupler, as was done by the Safety Appliance Act of 1893, and in requiring the use of the block system, is that the brake or coupler used in interstate commerce cannot be changed at the state line, while a signal post is a "fixture" on the soil of the state. But the proposed law says nothing about signal posts. It asks that a space interval be required between all trains engaged in interstate commerce. The constitutionality of the coupler law surely did not rest on the fact that a Federal enactment was the quickest way to secure uniformity of design. The government either had the right to make such a law or it had not, and if the Safety Appliance Act of 1893 were to come before the bar, it would have to be upheld on other grounds than those of mere expediency. This particular question turns on the ability or inability of the several states to make the necessary regulations. It was conceded in the Safety Appliance case that the state governments could never obtain the uniformity of specification necessary to make automatic brakes and couplers constitute a safety appliance, and those who are familiar with state legislatures, the ends served thereby and the process of manufacturing laws therein, will probably concur in this opinion. The same question now arises with regard to the block system. If the state governments be waited for, nothing will be accomplished.

Whether or not the courts would hold that interstate traffic and, specifically, the carrying of the mails, is jeopardized in trains which are not run by the space interval system, and that, being jeopardized, the government has the right to interfere, we cannot say. We incline to the belief, however, that the proposed law would be held constitutional, but we are disposed to doubt that its constitutionality would ever be tested. With regard to the question as to where state protection of people on the railroad shall stop, it seems hardly necessary to carry this out to the extreme limits suggested. As Colonel Prout himself says, the British Board of Trade has been showing for a great many years that this protection can be afforded with an arbitrary limit far short of complete government control. The British Board of Trade has been a great life-saver. That it is concerned with a great many appliances and devices which add very largely to fixed charges and scarcely appreciably to public safety, seems to be a consequence rather of the British temperament than of the general system on which the Board of Trade regulation is based.

Entirely apart from accidents to trespassers and from what may be called the unavoidable, or almost unavoidable, death rate from extraordinary accidents where there is no negligence, too many people are being killed in train wrecks. Inasmuch as a safety appliance act already exists, and has existed for 10 years without any apparent damage to states' rights, it may conceivably be extended to cover the question of the fixed space interval, likewise without any damage to states' rights; and if this can be accomplished, there is no doubt that the annual death rate from railroad wrecks in this country, which has for years made a scandalous showing in the eyes of the world, will be greatly reduced.

The coupler law was passed after the principal roads had decided on their course and it was clear that the automatic coupler of the Janney type was destined to prevail throughout the country; and the law served to bring the laggards into line. A parallel case exists now; the most enterprising roads have adopted the block system, but others have not done so, and some of the large ones are slow in extending it. As all efforts have failed to awaken these laggards it is

not strange that President, Congress and people conclude that a Federal law is the only practicable remedy for the great losses of life from collisions. What can we say to them?

REACTION IN ELECTRIC RAILWAYS.

The Massachusetts Electric Companies is a "holding" corporation owning or controlling various electric properties, chiefly street railways in eastern Massachusetts with extensions into Rhode Island and New Hampshire. It manages them through two operating corporations representing, through consolidation, some 40 original and independent properties. It operates, according to a recent return, in 22 cities and 66 towns; has 854 miles of street railway track; $6,333,911 gross earnings; and preferred stock (cumulative) of $20,557,400; common stock $14,293,100, and so-called "coupon notes" of $3,500,000, saying nothing of the underlying debts of subsidiary corporations. This great street railroad corporation—for such it may as well be called—after paying for some time an annual dividend of 4 per cent. on its preferred stock, has just passed the semi-annual dividend of 2 per cent. normally due next month.

Such an incident has some importance in itself in the case of the corporation of such magnitude, the owner of so large a system of street railways and in a State where capitalization of those lines—as distinguished from the holding company itself—has been rigidly limited by the rule and policy of "replacement value" adopted and enforced by the Massachusetts Railroad Commission. It would even have its importance if due to local or specialized or transitory causes such as a new plan of financing the parent company or its subsidiary bodies. But, in fact, the causes assigned are more general and, therefore, more significant. They are connected with heavy operating expenses during the year and these, as well as traffic returns, connected in turn with a severe winter followed by a cold summer, the latter bearing heavily upon excursion business. In fact, it is predicted that, in Massachusetts, the summary of street railway business, when compiled by the State Commission, will show generally for the year past—except for business in the larger cities, notably Boston—a considerable falling off. Related to the same subject and on a more extended scale are returns for the last ten years which show a reduction in street railway gross earnings from $11.972 to $10.124 per mile operated, and of net per mile from $3.651 to $3.180, while net earnings per car mile fall from 9.23 cents to 7.46 cents though the average per passenger car mile rate from 1.54 cents to 1.59 cents. As an isolated but suggestive fact it may be added that at a single session of the United States Circuit Court at Boston last summer there were three applications for street railway receiverships.

The Massachusetts example, of course, has some qualifying facts such as a reduction during the last ten years of operating expenses from $8.321 to $6.944 a mile, and other economies due to system, experience and consolidation of properties. But the facts in that State collectively carry out the idea that a period of reaction in street railways is at hand even if it has not positively begun. The street railway—as demarcated somewhat sharply from the long distance electric line—is probably following out the natural destiny attending the discovery of a new and highly useful motive force. At first came, 15 years or more ago, the early tentative efforts to adapt electricity to the old horse car line; next the demonstration of its popularity and, what was more to the point, its profits, especially on old urban routes; then the loud popular demand for it, echoing into the rural regions, the frenzy of new construction with overcapitalization as a pervasive factor; and, at the last, exhaustion of profitable territory, the proof that even the popularity of the electric street line is dependent on such accidents as the state of the weather and the inevitable force and reaction not merely affecting new projects but the prosperity of the completed road. And attention may also be called to the fact that the great majority of the street railways of the country have yet to stand the final and searching test of a period of serious industrial depression.

A single feature in the up-to-date status of the electric railway, as exemplified by the Massachusetts experience, deserves its brief and final reference—namely, "novelty" traffic. In the early stages of the successful trolley perhaps nothing was more forceful in stimulating fresh enterprise than the volume of business on the newly opened line derived from passengers who had never traveled in a trolley car before; and, under the spur of the novel passion, they took their recreative rides over and over again. But "novelty traffic" on the electric street railway has passed now to a secondary and reduced stage. With the trolley car a familiar fact novelty traffic on a new line rests not on the fresh experience of a strange and agreeable motion but either on a desire to "see the country"—which quiets itself in one or two trips—or on the momentary delight of a new and nearby convenience which very quickly becomes old. For a novelty that was general, extensive and somewhat prolonged has been substituted a novelty that is local and, by comparison, transitory. It is not, perhaps, a very striking change, but, in the history and evolution of the street railway, it is symbolical of other changes of more importance.

The decision of the Supreme Court of the United States in the Johnson case, reported elsewhere in this issue, substitutes common sense for technicalities, and judicial clearness for verbal imperfections in the automatic coupler law of 1893; and it reverses the lower court, where the railroad company won its case on the ground that a tender is not a car and that, even if it were, the law is complied with when one car has a Janney coupler and another has a Miller, a radically different type. The details of the Johnson case were given in the *Railroad Gazette* of Jan. 2, 1903, page 10. Under the original law this absurd use of diverse types was, apparently, lawful. Practically, no railroad tried to couple Janneys to Millers, but legally they might do so, as the statute was so crudely drawn as to seem to permit it. The act of March, 1903, was passed to correct this defect; but Chief Justice Fuller holds that the amendment was unnecessary; by a rational interpretation the original law forbids all attempts to use couplers not adapted to each other. In the Johnson case it was plain, of course, that the Janney on the tender and the Miller on the car could not be fastened to each other without a link, and Johnson lost his case, not only for the reason just mentioned, but also because it was clearly a situation where he could see that special danger existed and special care was required. But the Supreme Court does not countenance hair-splitting, and declares unequivocally that, for the purposes of this law, (1) a tender (and, of course, an engine, a snowplow, etc.) is a car; (2) that automatic coupling is required every time two cars are brought together; and (3) that in deciding whether or not a car is used in interstate service, the courts should not limit the effect of the law by the employment of petty technical distinctions. In this last point the Supreme Court confirms the view of District Judge Shiras as expressed in the Voelker case. The second point seems to bear very severely on a road which has to move broken cars by coupling them with chains, or by the employment of other makeshifts; but if this proves a hardship, Congress could probably be induced to pass an amendment.

Attention is called to a typographical error in the paper on Heavy Electric Traction, by O. S. Lyford and W. N. Smith, read before the American Institute of Electrical Engineers on November 25, and abstracted in our issue of Dec. 9. The second term of the traction formula proposed by Mr. Smith at the top of page 615 was incorrectly stated as 1.67 V. in the advance sheets sent out. It should have been .167 V.

November Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of November, printed in another column, contains accounts of 25 collisions, 28 derailments, and one other accident. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

		Killed.	Injured.
11th.	South Mound, Kan.	1	9
12th.	Boyds, Md.	0	12
12th.	Azusa, Wyo.	13	20
13th.	St. Louis, Mo.	1	6
14th.	Chadd's Ford Junction, Del.	1	3
16th.	Elmdale, Mich.	3	8
20th.	Wyland, Pa.	2	0

Of the 13 persons killed at Azusa eight, at least, were employed on the trains. The cause of this collision as we have given it is one of two causes reported in the newspapers, but it is the one said to be "semi-official." A death-list in a single collision which includes eight persons not passengers, calls to mind the fact that with the increasing volume of mail and express traffic, both carried on the fastest trains, and the large number of double-head trains now run, a record of passenger casualties alone does not afford a fair index of the dangers attending our fast trains. The principal advantage to be had from separating the passenger list from that of trainmen is due to the fact that more care is taken to safeguard the lives and limbs of passengers; the passenger death list affords a measure of the success attained when the railroads have supposedly done the utmost possible to prevent accidents. But the only legitimate ground on which we can justify less effective measures for

the protection of trainmen than are taken for the protection of passengers is that of necessity; we have no right to impose greater risks on the employees unless it is impossible to avoid doing so. In view of this principle we must look upon the Azusa collision in the same light as though it had killed 13 passengers, for if the right kind of protective measures had been in force, the engines and baggage cars would have been safeguarded as well as the passenger cars.

A large proportion of the collisions in this record occurred at or near stations, and some of these on roads where the block system is in use. It is important to note, in connection with these cases, that the block system is used in a modified form; it is only a partial protection, like permissive blocking. For example, a single track road blocks trains from station to station, yet has no distant signals at the stations and often no home signals; or has a single signal by which a part only of the switches at the station can be protected. In such circumstances a train receiving a signal at A to proceed to B really receives this authority subject to the condition that the switches at B must be approached cautiously. Complications will constantly arise, of course, necessitating departure from this fundamental principle that all movements shall be completely controlled by fixed signals and the substitution of rules instead of signals. A case of this kind in the present record is that of the collision at Boyds, Md., which is described by the reporter as follows:

The Duquesne Limited was coming eastward and had orders to meet express No. 3, westbound, at Boyds. It was made up of eight cars and was in charge of Engineman Hall and Conductor Hendrix. The express, in charge of Engineman Zepp and Conductor Hammond, had arrived at the switch, 200 yards east of Boyds, and was pulling into the siding to allow the limited to pass. When the limited approached, the engineer blew his whistle for the block target, and Operator Emerson, thinking No. 3 had cleared and passed onto the side track, gave him a clear target. Hall gradually gave his engine more steam, and soon the train was making 30 miles an hour. Then, to the horror of the engineer, he saw two coaches ahead which proved to be the rear end of train No. 3, which was pulling into the side track. The heavy locomotive struck the cars, "sideswiped" them, and drove the second sleeper clear over and down an embankment.

Another accident in November which deserves notice is the derailment at South Mound, Kan., on the eleventh, killing one employee and injuring eight passengers. The tender of the locomotive "jumped the track at full speed." From circumstantial evidence it appears quite clear that tenders are often loaded so unevenly as to make them very unstable, and liable, with the aid of irregularities in the track, to lift a wheel. It would seem that the question of securing positive and conclusive evidence on this matter should receive careful attention.

The number of electric car accidents reported in the United States in November was 20, in which 18 persons were killed and 190 were injured.

We find only one important train accident in Canada in November, but that one was quite serious. On the Intercolonial, at New Glasgow, Nova Scotia, on the 7th, a freight train of seven cars broke through a bridge and fell into East river, the engine and tender having passed over in safety. The bridge was a lattice girder 80 ft. long, of English make, erected about 37 years ago. There was a street car accident in Toronto on the 17th in which four occupants of the car were killed. The car became uncontrollable on a descending grade, broke through the gates at a crossing of the Grand Trunk, and was run into by a freight train.

The description, in another column, of the road motor omnibus services which the Great Western Railway of England has recently established, deals with practice almost unknown in this country. These road services, which are designed primarily to connect otherwise inaccessible places with the railroad, have very little in common with trolley lines in the work which they perform. Their running speed is low and the fares are high, yet the experiment seems to have met with considerable success in England and on the continent as well. In fact, certain continental services have been in successful operation for some years, replacing former carriages and horse omnibus lines. It seems improbable that this means of conveyance is at present likely to find extended use in the United States, for it requires pretty thickly populated country to make such a service profitable—and the thickly populated portions of the United States are rapidly being served by trolley lines, which can offer much higher speed and can consequently cover a larger territory than can be done by any omnibus service. But the advantage of motor omnibuses as compared with trolley lines is that they can be temporarily tried in a locality and then withdrawn without loss of capital if they are not profitable, and it is quite conceivable that use might be found for them as an adjunct to suburban railroad services, or, indeed, to main line services where traffic originates at some little distance from the railroad station. In spite of the American commuter's well-known objection to changing conveyances on the way to and from his work, there are numerous suburban districts in the vicinity of all our great cities where a good motor omnibus service could undoubtedly increase the field tributary to the station, and save enough time, morning and night, so that new residents would be attracted to the district.

The annual report of the Superintendent of Railway Mail Service for the fiscal year ended June 30, 1904, again strongly urges publishers to classify their mail before sending it to the post office, thereby saving a great amount of labor both in the offices and in the mail cars. The enormous bulk of this second class mail which is being handled is well shown by the comparative totals throughout the country for the last six years. The increase has been steady, from 352,051,608 pounds in 1899 to 569,719,819 pounds in 1904. By way of reducing this to a more familiar figure it may be mentioned that the weight of the second class matter for the current year ending June 30 was well over 284,859 short tons. That is to say, this pile of newspapers, magazines, etc., would be equivalent to the gross tonnage of some 20 battleships of the largest size commonly found in the great navies of the world; or it would fill over 7,000 forty-ton freight cars; say 150 long trains. A hasty calculation, more picturesque than useful, shows that if this second-class-publication mail were distributed equally throughout the country, every man, woman and child would have between seven and eight pounds of it to read. It is to be feared that a good deal of this literature is designed to be read by the pound. New York easily leads in the output of second class mail, with 937 publications and 10,135,103 pounds of literature. Chicago is second with 602 publications and 5,363,367 pounds of second class mail matter, including a small amount which is free in the county. The number of sacks of mail sent out from New York in the past year was 184,980, an average, therefore, of over 500 a day.

The proposed underground moving platform for handling the heavy cross-town traffic on 34th street, New York City, has many features which commend it. The conditions which have to be met are ideal for the use of such transportation methods, as the distance is short and the number of stations is large. It is undoubtedly true that the cost of operation, including interest and depreciation, of a moving platform between First and Ninth avenues will be much less than the cost of a double-track railroad similar to the New York subway. The reasons for this are well set forth in the article which appears in another column. Moving platforms are by no means new, but heretofore they have not been used extensively except for amusement or spectacular purposes. The designs which are now proposed, however, seem highly practical. The only serious objection seems to be the fear that people will not learn to get on and off the platform without falling down, but such dangers are largely imaginary, as the relative speed of each section of the platform to the one next faster is less than the pace at which a man walks.

NEW PUBLICATIONS.

Practical Coal Mining, by T. H. Cockin. 428 pages, 4½ in. x 7 in. The Norman W. Henley Publishing Co., New York, and Crosby, Lockwood & Son, London. Price $2.50.

The author of this work, who has a thorough practical knowledge of his subject, is a member of the Institution of Mining Engineers of England and a lecturer on coal-mining at Sheffield University College. This book is intended for students and for those preparing to qualify for first or second class colliery managers. It is clearly written and contains over 200 illustrations. The author assumes that the reader has no previous knowledge of mining and he has therefore discussed each subject in detail.

Fowler's Mechanical Engineer's Pocket Book. By William H. Fowler. London: Scientific Publishing Company, 1905. Leatherette, 498 pages, pocket size. Price, 1s. 6d. net.

In this new edition many substantial additions have been made. A new section on entropy has been added and this subject is treated in a thoroughly practical manner, so that its application to problems in steam engine design is easily understood. In all about 50 pages of new matter have been added to the book, which include notes on steam turbines, high speed tool steel, emery grinding, milling, reaming, etc.

TRADE CATALOGUES.

Condensers, Vacuum Pumps, Etc.—The Deane Steam Pump Company, of Holyoke, Mass., is distributing its new catalogue No. D-23. This publication reviews the principles and advantages of the several types of condensers as applied to steam engines, including surface and jet condensers, vacuum pumps, exhausters, air and circulating pumps, and other auxiliaries are also briefly discussed. A recent development, which is treated of quite fully, is the provision of proper condensing arrangements for steam turbines. Unlike the reciprocating engine, the turbine can expand its steam to the extreme limit of the exhaust pressure and every inch of vacuum above 26 in. increases the economy by from 3 to 5 per cent. It is therefore advantageous to use the most per-

fect type of condensing equipment for this service, which has led to the production of improved types of independent air and hotwell pumps, separate circulating pumps, air coolers, etc.

New York Central & Hudson River Railroad.—The Passenger Department of the New York Central has just issued No. 36 of its "Four-Track Series." It is entitled "The Winter Boarder," and gives a list of more than one thousand hotels and boarding houses in all parts of the country, giving the name and address of the proprietor, the number of people the house can accommodate, its rates per day and per week.

This booklet covers the country quite generally from New York to the Pacific Coast, including the Adirondack Mountains, Canada, Colorado, Utah, Arizona, New Mexico, Texas, California, Washington and Oregon, and also includes the Hawaiian Islands.

Direct Current Motors.—The Westinghouse Mfg. Co., Pittsburg, Pa., sends a pamphlet descriptive of its type S motors for direct current circuits. A brief discussion of the advantages of electric drive is given as well as illustrations of the motor as applied to various classes of work.

Rope.—C. W. Hunt Company, West New Brighton, Staten Island, N. Y., sends a folder descriptive of its "Stevedore" rope. The sizes of this rope kept in stock and the approximate price per 100 ft. are given, as well as names and illustrations of 29 different kinds of knots.

Rock and Ore Breakers.—Allis-Chalmers Company, Milwaukee, Wis., sends a catalogue descriptive of its style "K" Gates rock and ore breaker. It is handsomely illustrated throughout with half-tones and a full detailed description of the machine is given.

CONTRIBUTIONS

Compulsory Block Signaling.

New York, Dec. 19, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Interstate Commerce Commission has repeatedly asked for the enactment of a Federal law, which would compel the railroads to protect their lines by block signals, and the President has recommended such an act. The Railroad Commissioners of some of the states, and various state officials, have also urged compulsory block signaling. The distressing list of accidents for the last year or two has given new force to this movement. Some expert observers at Washington think that no Federal legislation for block signaling will be had this winter; but they may be mistaken, and it will be wonderful if there is no such legislation in some of the states.

In times past I have expressed the opinion that a Federal Act to compel the railroads to signal their tracks, would be unconstitutional, and I have always expressed the opinion that either Federal or State legislation would be inexpedient and unfortunate. I still hold those opinions, and for certain special reasons, a few of your readers may be interested to know why. At least I may provoke discussion that will lead towards the formation of correct opinion.

We must assume that the President and the Commissioners have taken legal opinion; and it may seem impertinent to raise the constitutional question. Yet, an act to control signals by Federal power seems a plain invasion of the rights of the states. The constitutional right of Congress to regulate commerce between the states has been made to cover power brakes and automatic couplers, and it is assumed that by analogy it should cover block signals; but there is no real analogy. A brake or a coupler cannot be changed at the state line, but continues to operate throughout the entire journey of the car engaged in inter-state commerce. Congress, by its constitutional right to regulate commerce between the states, may say that a car starting in Pennsylvania must be made safe for its journey through New Jersey and into New York. At least, Congress has said so, and most of our fellow citizens acquiesce. But the safety of a car moving across New Jersey is not a bit affected by the presence or absence of signals in Pennsylvania. It is said that the car in Pennsylvania carries passengers or things destined for New Jersey, and is doing interstate commerce; hence its safety in Pennsylvania may properly come under the care of the general government. This doctrine is inadmissible if we are to keep the scheme of federated society, under which we started, and which we have been taught from childhood is the most perfect form of government that the mind of man ever devised or carried into action. If Congress, in the exercise of its power to regulate commerce between the states, may enter a state to prescribe one fixture on the soil of that state, it may invade the state to prescribe another. It may require that switches be interlocked and signaled. It may scrutinize tracks and bridges and fix standards of construction and maintenance. These are elements of safety no less important than block signals. But what shall we do if the opinion of the people of Massachusetts or of the people of Indiana, as expressed through their legislature, differs from the opinion of the nation, as expressed through Congress?

It must be the duty of the state to protect the people traveling within its borders, and to deliver them safely at the state line, and until the state government breaks down the Federal government has no right to interfere. This seems to me to sum up the Federal situation in the matter of block signals, but I cannot pretend to be a constitutional lawyer, or any other kind of a lawyer, and I have probably missed the point.

If the Federal Congress has no right to invade the states, and order block signals to be placed on their soil, at least the states themselves may require block signals within their respective borders. But the expediency of this is at least questionable.

Block signals are only one element of safety. Many people are killed and injured for lack of interlocking; many others are killed and injured in derailments due to bad track; and still other casualties are due to inadequate bridges. Much of the greatest mortality on railroads is among trespassers on the right-of-way, and among careless passers at highway crossings. If the state begins the protection of people on the railroads, where shall it stop? Surely it should not stop short of the control of interlocking and of permanent way and structures; and it should not stop short of protecting railroads against trespassers, and trespassers against themselves. But this is only the beginning of state control. It is a commonplace that signals will not be displayed or obeyed without discipline and that track and structures will not be maintained without discipline, but there is great reason to believe that to a gradual let-down of discipline, more than to all other causes, is due that increase of accidents which has alarmed the public; and there are many railroad officers who hold, whether correctly or not, that this let-down of discipline is principally due to the influence of the unions. If then, the state is going to step in and prescribe means of safety, it cannot with propriety overlook discipline and the agencies which are acting to undermine it. Back of all is the General Manager with his superintendents. If these gentlemen are incompetent, no expenditure for safety appliances, no precautions designed to improve discipline, will be of much use. The state must extend its control to the superior officers of the railroads, and insure their fitness for the great responsibilities of their posts.

In short, there is no logical stopping place this side of that complete control of railroads which has been so thoroughly and admirably put in practice in Germany, and five minutes of reflection will satisfy any one but a confirmed socialist, that for such a degree of state control, we are entirely unfitted by habit, by temperament, and by social and political organization and methods. We, like the English, are accustomed to meet our emergencies as they arise. Perhaps we might profitably do as the English have done, and attempt some control with an arbitrary line far short of complete state control of the railroads. But it is my fixed belief that the more liberty we leave to the railroads, the more efficient and economical service we shall get. That is the great lesson of the history of railroad development in our land. On the other hand, the present disposition of the people indicates that if the railroads would retain that liberty, they must deserve it.

H. G. PROUT.

The following statement about the existing status of the desired legislation in connection with the proposed American Railway Appliance Exhibition in connection with the International Railway Congress, is made by Mr. Geo. A. Post, Chairman:

There was no quorum in the House of Representatives on Monday last, owing to the near approach of the holiday recess and the absence of a large majority of its members. Congressman J. R. Mann, of Chicago, continued his vehement opposition to our resolution and compelled the postponement of consideration until Jan. 9, 1905, when a quorum is assured. There is no doubt that the resolution will be adopted when it is considered by the full house, but Mr. Mann has been able to defeat our efforts to obtain the quick action so greatly desired, in the absence of a quorum, because of the power given under the rules of the House to a single representative to block legislation until a quorum is present. Monday, Jan. 9, is District of Columbia Day in the House, and on that day the Committee on the District of Columbia having charge of our resolution will call it up for action in regular order. I believe that there is no occasion for uneasiness on the part of those interested in our proposed exhibition regarding the ultimate result in Congress.

Single-Track Blocking Discussed at N. Y. Railroad Club.

The subject for discussion before the New York Railroad Club at its meeting of December 16 was the "Theory and Practice of Single-track Blocking," a paper on the subject being read by Mr. H. D. Emerson, a civil engineer and newspaper writer. The first part of Mr. Emerson's paper was a dissertation on the difficulties of running trains on single-track lines without the block system, showing the dangers of the American train-despatching method. Coming to his principal subject, he first took up Tyer's tablet, and next the electric train staff. In speaking of the staff he presented a letter from Mr. Sperry describing briefly the operation of the Union staff instrument, and one from

Mr. Short, of the Cincinnati, New Orleans & Texas Pacific, telling of the experience of that road with automatic signals and with the staff. Mr. Short makes the statement, which has been published before, that the automatic block signals on his road have increased the capacity of the line 75 per cent. at night and 50 per cent. in the daytime. He says that the cost of installing Hall electro-gas signals on single-track, at intervals of 1½ miles, is $850. This, we suppose, includes the cost of two signals, and means the cost per block, not the cost per mile. The maintenance per year is $131.20. For the Union electro-gas signal he gives for the same equipment $720 cost, and $124.90 maintenance. With the automatic signals on this road, the time-table and train despatcher are still supreme, and the fixed signals are an auxiliary; but on the short sections where the electric train staff is used, the time-table and the train despatcher's authority are suspended, the staff being supreme. On these sections the capacity of the line has been increased from 35 per cent. to 40 per cent. The C., N. O. & T. P. is operated as follows:

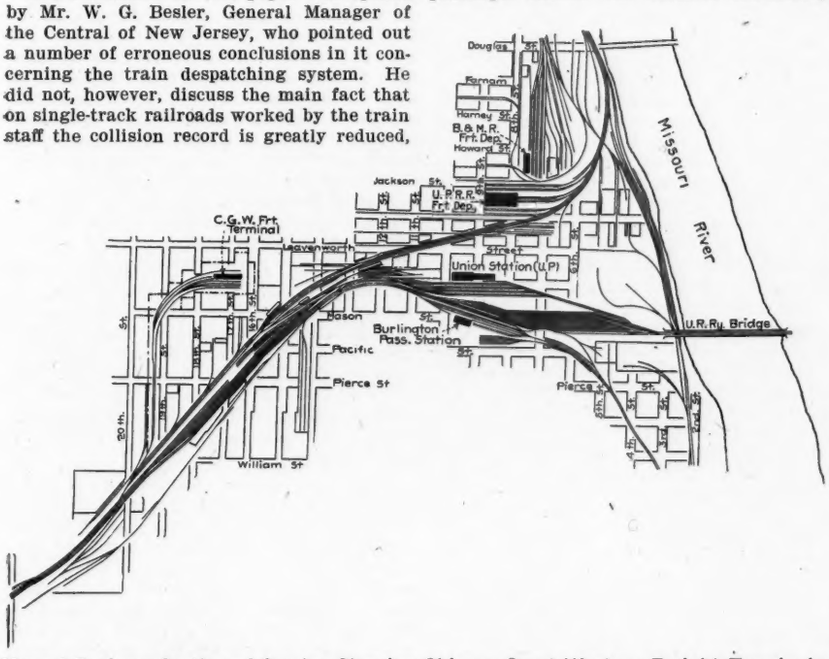
By automatic signals	298.2	miles.
Telegraph block system	18.1	"
Electrical train staff	13.1	"
Yards, not signaled	5.6	"
Total	335.0	miles.

That part of the paper which deals with the train staff contains a brief account of the method of operation of the Union Switch & Signal Company's latest design, which is described in another column of this issue of the *Railroad Gazette*.

The discussion on this paper was opened by Mr. W. G. Besler, General Manager of the Central of New Jersey, who pointed out a number of erroneous conclusions in it concerning the train despatching system. He did not, however, discuss the main fact that on single-track railroads worked by the train staff the collision record is greatly reduced, and the capacity of the road increased. Mr. Besler read from a prepared paper, and beyond this there was little discussion. The common train staff, as used in England for nearly half a century, is in use on an electric road in Canada, and has been used at one place on the surface street railroads of Brooklyn, N. Y. Reference to these incidents brought out commendatory remarks concerning the efficacy of a "stick"; and Mr. Sperry, being called upon after the other speakers had finished, summarized the situation by saying that, as Mr. Emerson had shown that the staff system was the safest method of operating single-track, and as the use of the "stick" had been advocated partly on the ground of the recent approval of a "big stick" policy by the President of the United States, the railroads would do well to heed the fact that the said President is now "after the railroads with a big stick."

Omaha Freight Terminal of the Chicago Great Western.

The Chicago Great Western has had its Omaha line in service for about a year and a half, although up to the present it has been without terminal facilities of its own in that city. It enters Omaha over the Union Pacific's Missouri river bridge and has been using the Union Pacific terminals, both freight and passenger. It also has in addition, the use of the Union Pacific tracks as far as the Omaha stockyards in the southwestern part of the city. Its use of the passenger station will continue indefinitely, but since its entrance to the city the Great Western has been engaged in the acquirement of land for, and the construction of freight terminals, which have just been completed and put in service.



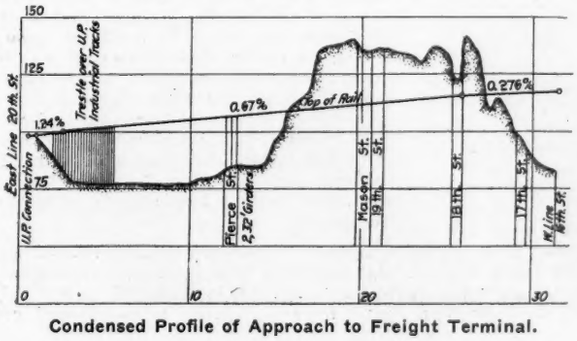
Map of Business Section of Omaha, Showing Chicago Great Western Freight Terminals.

The accompanying map shows that part of Omaha adjacent to the Great Western terminal property. The business district of the city lies directly north of, and only a few squares distant from, the freight house, its location being therefore an excellent one from this standpoint. The site was an expensive one, however, as nearly all of the land was improved property and its cost constituted a large part of the outlay for the terminal. The connecting tracks to the yard leave the Union Pacific near Twentieth street, crossing the low-lying industry tracks of the latter on a pile bridge 400 ft. long. This bridge is indicated on the condensed profile shown, which gives a good idea of the conformation of the land along the route of the connecting tracks, and on the terminal site. It will be seen that the principal part of the yard lies in a heavy cut. The grading at this point amounted to more than 150,000 yds., the material being used to fill in from Sixteenth street to beyond Seventeenth street.

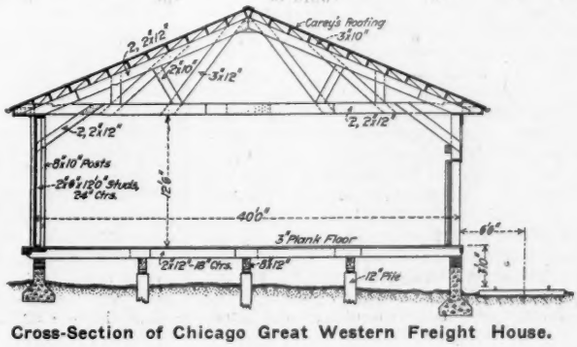
Pierce street is crossed on a double-track steel-girder bridge with concrete abutments. At Mason street, two blocks north, the excavation for the yard approaches reaches a depth of 30 ft. and street traffic is carried across on a wooden bridge. With the exception of these two crossings, all other streets leading across the yards and tracks have been vacated by the city. On Seventeenth, Eighteenth and Nineteenth streets, the city sewers and the pipes belonging to the gas and water companies had to be lowered at considerable expense, in order to carry them under the tracks.

It will be noticed that the Great Western property extends up to, and fronts on Sixteenth street. This street crosses the bottoms and the Union Pacific tracks on a steel viaduct which is 50 ft. high at its highest point. It was the desire of the Great Western, at the outset, to have the principal entrance to the terminal from this viaduct, with which it is on a level, but this privilege was denied the road by the city. Instead, therefore, that part of Sixteenth street lying between the viaduct and the property lines on the west side was raised to the level of the former by grading; level-grade entrances from Leavenworth street are therefore provided on both Sixteenth and Seventeenth streets. Teams have access to the team tracks from both sides of the yards on Eighteenth street and from the north side on Sixteenth and Seventeenth streets.

The general construction of the freight house is shown in the illustrations. As the filling under a part of the house was about 30 ft. deep, it was thought advisable, in order to avoid the costly foundations necessary for a permanent structure, to build a frame house for the present, without carry-



Condensed Profile of Approach to Freight Terminal.



Cross-Section of Chicago Great Western Freight House.

ing the foundations down to solid ground. The filling was done by team work, was thoroughly wetted during the progress of the work by numerous rain storms in the early part of the season, and is believed to be well compacted, so that there should be comparatively little settlement hereafter. However, to provide for any possible unequal settlement, the building proper, above the foundations, is resting on oak wedges so that it can be kept level as the fill settles.

The freight house is 46 ft. x 320 ft. and rests on a piling and concrete foundation. It is a brick-veneered building roofed with Carey's roofing. Thirty feet of one end is occupied by the office, and an additional 16 ft., for a part of the width, by a perishable freight room. Additional facilities include two 6-ft. x 8-ft. scales of three tons capacity.

We are indebted to Mr. A. Munster, Acting Chief Engineer, for the data for the foregoing.

Annual Report of the Interstate Commerce Commission.

The Interstate Commerce Commission has sent out a synopsis of its eighteenth annual report to Congress, from which we take the following:

Regulation of Rates.—The act to regulate commerce, as amended by the Elkins law of 1903, appears to be operating successfully as applied to carriers subject to its provisions; but these provisions should be extended to apply to other agencies connected with transportation which may now be used as a means of affording concessions to shippers. In the present state of the law, the Commission may find a rate complained against to be unreasonable and order the carrier to desist from charging that rate for the future; but it cannot, though the evidence may and usually does indicate it, find and order the reasonable rate to be substituted for that which has been found to be unlawful. Any reduction of the wrongful charge amounts to technical compliance and frees the carrier from any legal obligation under the order. The Commission can condemn the wrong, but it cannot prescribe the remedy. Two cases of unreasonable rates decided during the year are cited as showing some reductions from the rates found unreasonable, but which were not so great as those recommended by the Commission.

Carriers are entitled to ignore the order of the Commission and await the judgment of the circuit court upon a petition by the Commission and another trial of the issues in that court. The more important the case may be, the greater the benefit conferred upon shippers or communities, the less likely is the order of the Commission to be obeyed. . . . The amendments to the statute recommended by the Commission involve no fixing of whole tariffs of rates in the first instance or at any time, but simply the redressing of transportation wrongs shown to exist after full investigation, during which all affected interests have been heard; and when an order is issued against a carrier under such procedure, it should by operation of law become effective upon the date therein specified.

The amendments desired would not confer upon the Commission the power to arbitrarily initiate or make rates for the railroads. No "vast authority" has been asked by or is seriously sought to be conferred upon the Commission. Though the popular demand may eventually take that form, under the stress of continued delay in remedying ascertained defects in the present plan of regulation, the amendment recommended by the Commission, as to authority to prescribe the reasonable rate upon complaint and after hearing, would confer in substance the same power that was actually exercised by the Commission from the date of its organization, in 1887, up to May, 1897, when the United States Supreme Court held that such power was not expressed in the statute. The situation is increasingly grave, in view of the rapid disappearance of railroad competition and the maintenance of rates established by combination, attended as they are by substantial advances in the charges on many articles of household necessity. . . . Authority to require the establishment of joint through rates over connecting and continuous lines is also believed to be necessary, if authority to correct an unreasonable or unjust rate should be granted.

Private Cars.—In the use of private freight cars no concessions are made to shippers in refrigeration charges which amount to the payment of a rebate; a practical monopoly has been created in the movement of certain commodities, especially fruit, which has enormously increased to the public the cost of transportation; when the owner of the car becomes a dealer in the commodity transported, the fact of ownership gives him an important advantage over his competitor; when the owner of the car is also the owner of the commodity transported, an excessive rental for the car may amount to a preference in the freight rate, as against the shipper who does not own his car. By consolidation of various companies, the "Armour car lines" now has a practical monopoly of fruit in large quantities in most sections of this country. That company only permits its cars to move fruits in large quantities under an exclusive contract. It provides the necessary number of cars for a fixed mileage, the railroads agreeing that no other cars shall be used for the purpose. The Armour Company furnishes the refrigeration for which it makes a specified charge. The result is good service and adequate car supply, but an enormous and unreasonable increase in refrigeration charges. These exclusive contracts, when they result in unreasonable icing charges, are unlawful, and the failure of the carriers to publish such charges is also a violation of the statute. The private car lines and the railroad companies earnestly insist, however, that the icing is a private service over which this Commission has no jurisdiction under the present law; and if it should turn out after three or four years of litigation that our opinion is wrong, the shipper will be entirely without remedy. Great good would be accomplished by such legislation as would leave no room for such contentions, and provide more adequate and certain remedies for the suppression of these abuses. Common carriers should be made responsible in the matter of this special equipment and refrigeration service (if they are not now responsible), or the car line companies which provide this refrigeration for interstate shipments should be brought under the jurisdiction of the act to regulate commerce.

Terminal Railroads.—The terminal railroad owned or controlled by shippers is a most dangerous means of giving preference to favored persons. The case of the Illinois Northern Railroad Company used principally to move traffic to and from the works of the McCormick Harvester Company, a corporation subsidiary to the International Harvester Company, is cited as an example. [See *Railroad Gazette*, Dec. 9, p. 631.] Also the Chicago, Lake Shore & Eastern Railway. Until recently these practices were confined to a few instances, but to-day they are extending in all directions and, unless checked, must soon become general. All available means will be resorted to by the Commission to suppress the wrongdoing, but further legislation may be needed to furnish an adequate remedy.

Voluntary Submission of Controversies.—In two instances during the past year the Commission has been asked by both shippers and carriers to adjudicate controversies between them concerning the adjustment of rates. In each case the questions involved are of manifest importance as affecting the business of competitive communities and the traffic of the railroad lines by which they are served. While the Commission is not in express terms authorized to act as a board of arbitration in matters referred to it by consent of the parties concerned, the subject of controversy and the issues involved in both these requests presented such a state of facts as would have justified a proceeding upon formal complaint or of inquiry by the Commission upon its own motion, and they were thus clearly within the spirit of the statute which defines the functions of the Commission. Believing this view to be correct, the Commission accepted the responsibilities it was thus asked to assume. The proceedings in form were strictly in accordance with the provisions of the act, although the voluntary submission by the adverse parties gave them in fact the nature of an arbitration.

One of these proceedings is the differential rate case which involves the relative adjustment of rates in both directions between interior points in the United States and Atlantic seaports from Halifax on the north to Norfolk and Newport News on the south, including Portland, Boston, New York, Philadelphia, and Baltimore. A short history of the differentials prevailing as between these different ports upon freight traffic to and from the west is given in the report. The other case is what is known as the Memphis case, which involves, among other things, the relation of rates to and from Little Rock and Pine Bluff, Ark., as compared with those to and from Memphis. The point is suggested by these voluntary submissions that the usefulness of the Commision in this direction would be greatly increased if its determinations in such cases were sanctioned by authority not now possessed.

Pending Cases.—The cases now pending before the commission affect almost every locality in the United States. They involve unreasonableness of rates, discriminations in rates between persons or commodities, discrimination in furnishing cars, preference of particular persons or localities, overcharges, demurrage charges, pooling, and failure to publish tariffs.

Decisions.—Besides disposing of a large number of complaints through informal investigation the Commission has rendered during the year 27 decisions involving the following subjects: Divisions or allowances to terminal or industrial lines; (Hutchinson salt investigation, Michigan salt investigation, and the "tap line" case, relating to the divisions of lumber rates on short-haul roads in the southwest); allowances to elevators (Union Pacific elevator case); private car lines and refrigeration of fruit in transit; publication and filling of tariffs on import and export traffic; unreasonable rates (nine cases); long and short haul clause (three cases); unjust discrimination and undue preference (delivery of live stock in Louisville, furnishing cars for coal, early closing of depots at Cincinnati, charges for parlor car seats between New York and Boston, etc.), and pooling (immigrants from New York).

Tariffs.—Under this heading the Commission discusses defects in the construction, arrangement, and printing of tariffs. The most important defect is complicated con-

struction and arrangement, it being often impossible to determine the intended application. A common fault in joint tariffs is the failure to specify the routes over which the rates are intended to apply. A plan is suggested by which this defect may be remedied without adding very materially to the cost of the tariffs. Some roads file a general or blanket concurrence in all joint tariffs to which the filing carrier may be named as a party, with the privilege of filing nonconcurrence in any issue which is not satisfactory.

Routine Work.—There has been much increase of work on account of the greater number of complaints and the labor involved in securing enforcement of the safety-appliance and accident laws.

Court Decisions.—The United States Supreme Court, in the Baird case, recognizes sweeping authority in the Commission to obtain information from witnesses before it upon any subject tending to bear upon issues in cases and investigations under the interstate-commerce law. The circuit court for the western district of Virginia, in the Chesapeake & Ohio coal case, declares unlawful a contract to furnish coal under terms which gave the carrier less than its published rates, but fails to restrain the carrier from further departing from its published rates. The case was appealed to the United States Supreme Court. The orange routing case, applying to the routing of oranges and lemons from southern California, was decided in the United States circuit court in California in favor of the Commission. The court found the defendant carriers were unlawfully engaged in pooling.

Safety Appliances.—The good effect of the amending act, especially in securing more effective control of trains through the increased use of air-brakes, is marked. Since the law became fully operative the number of brakemen employed on trains has been reduced on some eastern roads upon the stated ground that the control of trains by air-brakes renders the employment of the former number unnecessary. The number of cars inspected during the year was 208,177, of which 65,183, or 31.31 per cent. of the whole number, were found defective. A smaller number were inspected this year than last, because the provision in the new law relating to air-brakes has entailed much additional work in inspection and securing evidence in air-brake violations. The law is generally well observed, so far as the proportion of air-brake cars in service is concerned, but many of these cars are run in such defective condition as to be really inoperative in respect to use of the air-brake. Instances of defects are given, and the failure of carriers to properly educate employees in the use of air-brakes is noted.

On account of the greatly increased size of trains locomotives should be equipped with two air pumps, or with pumps of the largest capacity. Air-brake cars are frequently found cut out without anything to indicate the reason for such action. This is generally due to the negligence of trainmen, who fail to apply defect cards. Trainmen are often careless in the observance of those conditions which lead to proper compliance with the law.

Many of the defects in cars found not in compliance with the statute were of such a nature as to require men to go between the cars to couple and uncouple them, thus violating the spirit and letter of the statute. While 31 per cent. of the freight cars inspected were found defective, only 42 out of 2,319 inspected passenger cars were found improperly equipped. The number of defective passenger cars was less than 2 per cent. of the whole, and these defects were generally of a minor character and were immediately repaired.

The number of trainmen killed in coupling accidents during the year was 278, and the number injured was 3,441. A large proportion of these deaths and injuries were due to defective equipment, compelling the men to go between the cars to couple and uncouple, and might have been avoided had proper attention been given to the maintenance of safety appliances.

It has been suggested that our inspectors should designate defective cars by making or carding them, but owing to the limited force of inspectors at the disposal of the Commission the carding of defective cars could only amount to scratching the surface, and would tend to shift the burden of responsibility for defective cars from the railroads to the Government. If the Government is to assume such responsibility for the carding of cars, it should have a considerable increase in its force of inspectors, a number of whom should be stationed permanently at prominent interchange points.

Two prominent roads entering St. Louis have issued notice that they will refuse to receive cars from other roads unless the coupling appliances are in good condition. This action has produced most excellent results.

The number of prosecutions for violation of various provisions of the safety-appliance law is noted. None of the suits has come to trial, and in most cases the suits have been settled without trial by the roads confessing judgment and compromising the amount of the penalties. These prosecutions spur the roads to activity in maintaining their safety appliances in better condition.

The extension of time granted to the Colorado & Southern and Denver & Rio Grande, to enable them to apply to Congress for a change in the amended law permitting them to dispense with the driving-wheel brake on their narrow-gage locomotives engaged in road service and substitute the water brake therefor, was further extended by the Commission upon application of the roads. These carriers presented a bill for this purpose, and it was favorably reported by the committees of both Houses at the last session, but did not come to a vote. In view of such action in Congress, the further extension until March 1, 1905, was granted.

Through concurrent action with the Civil Service Commission, improved rules have been adopted for the appointment of safety-appliance inspectors. The greatest care is taken to ascertain the technical knowledge of applicants for these positions and to enable the Commission to secure the services of the very best men. Inspectors are relied upon to secure evidence of violations of the statute, and no reliance is placed upon the furnishing of such evidence by railroad employees. There must be a sufficient number of inspectors to follow all violations closely and secure evidence for their prosecution in the courts, as well as to keep the Commission advised of the condition in which they find the equipment. Several court decisions relating to the safety-appliance law are mentioned.

Railroad Accidents.—The article in the report on railroad accidents opens with a table giving the principal totals for the years ending June 30, 1902, 1903, 1904. There were 43,266 employees injured and 3,367 killed in 1904, as compared with 33,711 injured and 2,516 killed in 1902. The figures for 1903 are intermediate between those for 1902 and 1904. The increase in the number of deaths of passengers in train accidents in 1904 compared with 1903 is 64½ per cent. There were ten unusually disastrous accidents during the year. The number of deaths resulting from these ten accidents, eight of which were collisions, is about 23 per cent. of the total number killed in all the train accidents of the year, which comprise over 6,000 collisions and 4,800 derailments. Although there has been earnest discussion of the subject in the public press, it is noticeable that the very magnitude of the questions involved appears to have produced some confusion, and in the multitude of causes assigned the real question in many cases has been lost sight of. The paramount requirement, as pointed out in the last annual report, is an effective measure for the prevention of collisions. The Commission urges with added emphasis the same means recommended in its last annual report—the adoption of the block system. The cost of introducing the manual block system can scarcely be called a burden when we see it introduced on single-track lines of not very heavy traffic and find no prominent mention of the expense in the annual reports of the companies. The same reasons that existed for the introduction of the automatic coupler and air-brake by the provisions of the safety appliance act of 1893 apply to the prevention of collisions by compulsory use of the block system.

The Commission recommends that the report of accidents in the annual reports to the Commission should be abolished and that the law be made to require the monthly reports of accidents to cover all classes of accidents. The difficulty in obtaining reports from all companies within the time prescribed by law is mentioned. The extent of these omissions may be inferred from the fact that 64 roads admitted having omitted to report accidents after their attention had been called to them by the Commission. These omissions amounted to a total of 109 deaths and 226 injuries during the year ended June 30, 1904. Suits have been brought against a number of railroad companies for failure to comply with the law. To supply the public with full and accurate information concerning the causes of accidents the facts ought to be made the subject of impartial investigation on behalf of the Government.

Statistics.—For the year ending June 30, 1904, the preliminary report embraces returns for roads representing 209,002 miles of line, or about 99 per cent. of the mileage that will be covered by the final report. On the mileage stated gross earnings were $1,966,633,821. The gross earnings for the previous year, on 205,313 miles, were $1,900,846,907, as shown in the final report for that year. For 1904 passenger earnings amounted to $539,428,374, freight $1,377,684,976, miscellaneous $49,520,471. The average of gross earnings per mile of line was $9,410 ($2,581 passenger and $6,592 freight). Operating expenses for the year ending June 30, 1904, amounted to $1,332,382,948, being equivalent to $6,375 per mile of line. The ratio of operating expenses to earnings was 67.75 per cent. The net earnings of practically the same roads, as included in the present statement, were, for the year 1904, $634,250,873, and for the year 1903, $640,644,138. The total income of the roads covered by the preliminary report was $735,037,557.

The aggregate of all deductions from total income was $682,958,610. These deductions chiefly were interest on funded debt, rents of leased lines, permanent improvements charged to income, taxes (which were $56,474,106), and dividends; leaving surplus of $52,078,947. According to the preliminary report, the operating companies included in it declared dividends during the year amounting to $184,450,446. The dividends declared by the same roads during the year 1903 were $160,856,307, thus showing an increase of $23,594,139 in dividends for 1904. As the report under consideration is confined to the returns of operating companies, it does not include any statement of the dividends declared by subsidiary companies, the prop-

erty of which is leased to others for operation. The income which these companies receive is substantially the rent paid to them by the lessee companies from which their own corporate expenditures, including dividends, are made.

The Union Electric Train Staff.

The Union Switch & Signal Company has brought out a new design of electric train staff instrument, called model No. 2. This design is like the last one made by this company in having a small staff, but in its mechanism it is more like the earlier Webb & Thompson design. As the reader is aware, the train staff is a billet of wood or metal which is given to the engineman of a train to signify that he has the right to the road between two stations, the names of which are inscribed on the staff. Without a staff, no engine can start from either station. A train running from A to B, with the staff for that section, gives up the staff at B and receives another one as authority to run from B to C, and so on. By the original plan a single staff was provided for each section, and thus could be used only by regularly alternating trains; thus, A to B; B to A; A to B, etc. By the use of tickets, a staff was made to serve for two or more trains following one another in the same direction. This, however, was cumbersome, and the electric apparatus was devised to make the staff always as readily available at one end of the section as at the other. Tyer's tablet apparatus was the first electrical device of this kind; next came Webb & Thompson's electric train staff (1889); then the American modification of this, brought out by the Union Switch & Signal Company a few years ago, and now we have the latest

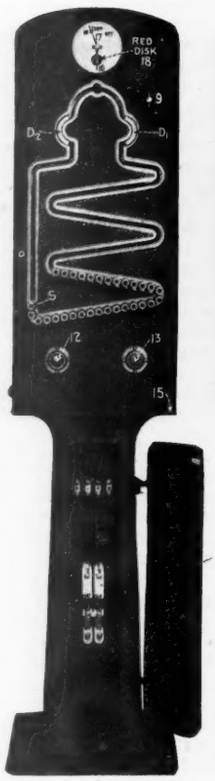


Fig. 1—Front View, Normal Position.

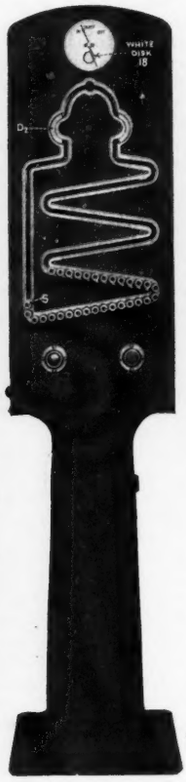


Fig. 2—Indicator 16 Showing White.

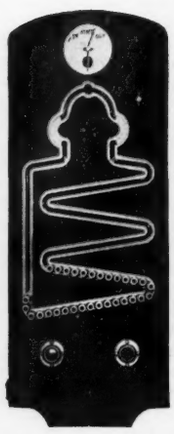


Fig. 3 — Indicator Showing "Staff Out."

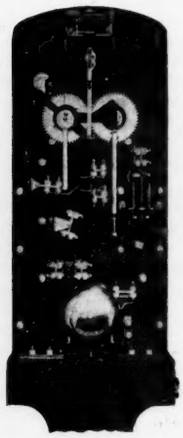


Fig. 6—Staff Out; Same as Fig. 3.

improvement.* The most noticeable outward change that has been made is in the arrangement of the magazine, Fig. 1, by which the staffs must always be taken out at one point and be put in at another, so that all of the staffs are used in rotation. In the earlier designs a few of the staffs did all of the work.

Of the illustrations, Fig. 4 shows the apparatus in the same position as it is in Fig. 1; Fig. 5 the same as Fig. 2; and Fig. 6 the same as Fig. 3.

The principal parts are shown in Figs. 4

*The Webb & Thompson staff machine was described in the *Railroad Gazette*, August 1, 1890. The operation of the staff on the Philadelphia & Reading was described Dec. 6, 1901, and on the Atchison, Topeka & Santa Fe Dec. 19, 1902.

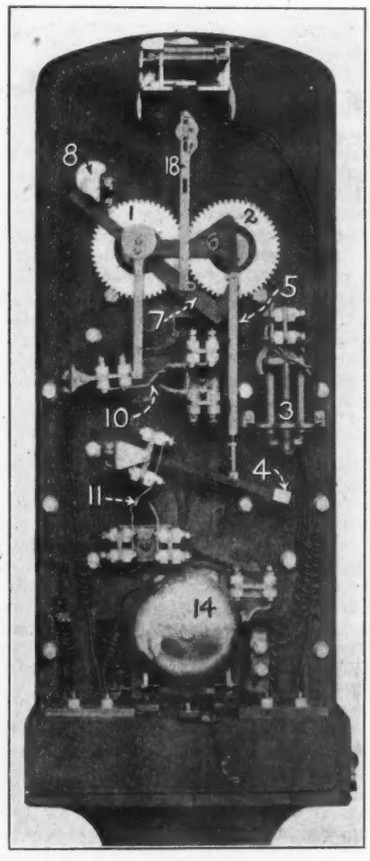


Fig. 4—Back View of Interior; Corresponds to Fig. 1.

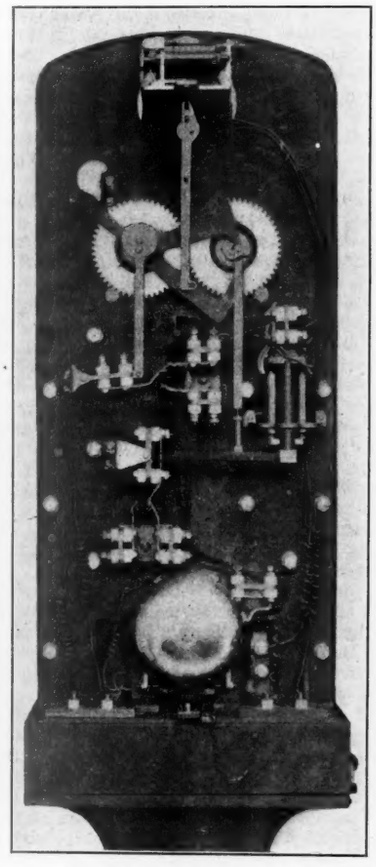


Fig. 5—Back View of Interior; Corresponds to Fig. 2.

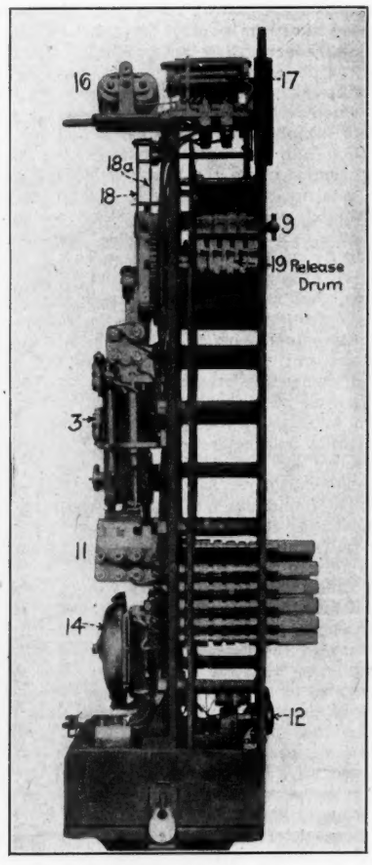


Fig. 7—Side View.

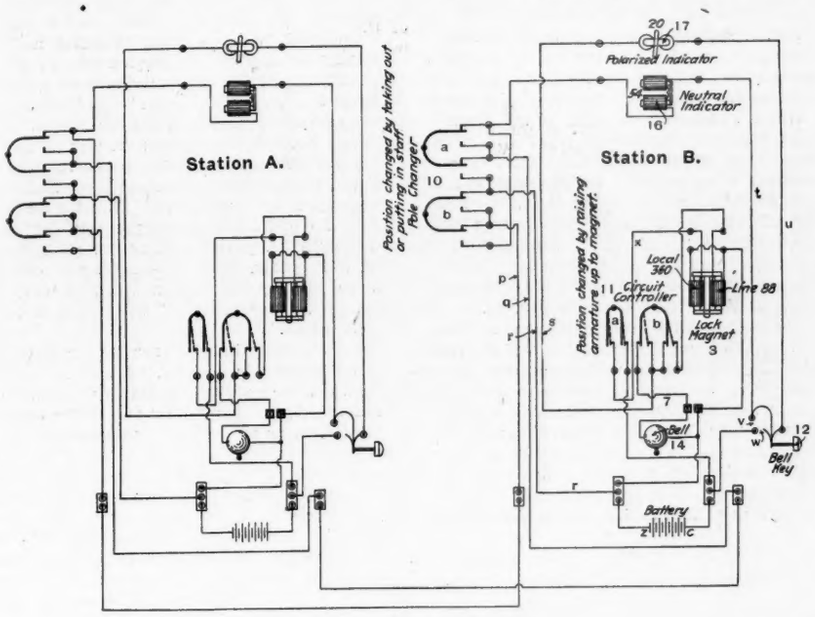


Fig. 8—Electric Circuits.

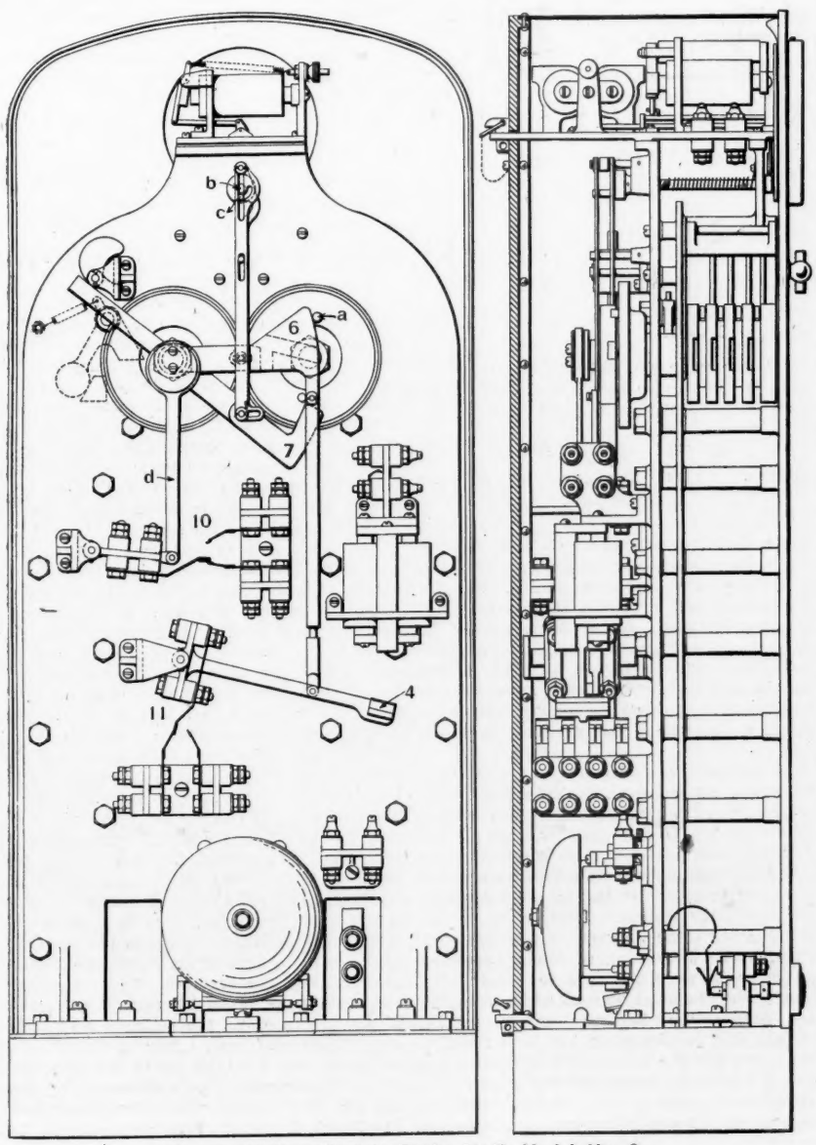


Fig. 9—Union Electric Train Staff, Model No. 2.

and 7, as follows: 1, releasing wheel, and, 2, locking wheel, these being geared together, and always moving in unison; 3, special compound magnet; 4, armature of magnet; 5, rod to lift armature; 6, lock; 7, arm for lifting 5, 6 and 18; 8, cam (turned by knob 9, Fig. 1) for moving arm 7; 10, pole changer; 11, circuit controller; 12, bell key (key 13 shown in Fig. 1 is not used); 14, bell; 15 (Fig. 1), base; 16 (Figs. 1 and 7), neutral indicator; 17, polarized indicator; 18 (Fig. 1), red disk; 19 (Fig. 7), releasing drum. Disks D 1 and D 2, Fig. 1, can be revolved only when wheels 1 and 2, Fig. 4, are free to revolve with them.

Compound magnet 3 consists of one coil of high resistance and one of low; the two, when energized by currents of opposite polarity, both exert an influence in the same direction to hold an armature placed between them, at right angles to a line passing through the axes of the two coils. The electrical connections are shown in Fig. 8. The arrangement is the same at both stations, and there is one metallic circuit (two wires) from station to station. The normal position of the apparatus is as shown in Fig 4; and the electric circuit from station to station is normally dead. The operator at A, desiring to send a train to B, calls *B* by pushing the bell key 12 (Figs. 1 and 7), which closes the points at *w* (Fig. 8), closing circuit through indicator 16 at station B (as well as in his own machine). At B, points *w* being open, the current passes through the polarized indicator 17 also; and thence through wire *s* and points *b* in the circuit controller, 11, to bell 14; thence through wire *r* and points *b* in pole changer, 10, and wire *p*, to line, and back to station A.

If all the staffs are in, at both station *A* and station *B*—that is, if no train is in the block section—*B*, responding, presses key 12 and holds it in until *A* turns knob 9. The turning of knob 9 at A, depressing the left hand end of lever 7 (Fig. 4), by means of cam 8, lifts 5, bringing armature 4 up to the magnet; and also lifts lock 6, thereby unlocking wheel 2 by removing the obstruction from the pin *a* in this wheel (Fig. 9). At the same time the other pin in wheel 2 is obstructed by the lower end of lever 7, and the wheel cannot be moved until lever 7 has dropped to its normal position, as shown in Fig. 5.

The operator at A therefore does not hold knob 9, but at once releases it, and arm 7 falls back; but armature 4 is held by the magnets. When *A* lifts 4 he moves controller 11, closing the circuit through wire *x* (Fig. 8), and local coil 360 of magnet 3, at the same time opening the circuit through wire 7 and the bell. The current from station B is by this transferred from the bell to line coil 88 of lock magnet 3. By this means this current (points *w* at B still being closed) energizes both coils of 3 so that they act together to hold up armature 4. The apparatus is now in the position shown in Figs. 2 and 5. The red disk has become invisible, indicating that a staff may be taken out.

A now lifts a staff *s* (Fig. 2) to the disk D 2, and, revolving the disk one-half revolution, removes the staff from the machine and delivers it to the train.

The relation of lever 6 to wheel 2 is shown in Fig. 9. Locking pin *a* is released as soon as lever 6 is raised sufficiently to bring the slot shown by the dotted line opposite the pin, this slot being cut in the back side of the lever. The control of disk 18, Fig. 1, by lever 7 and lock 6, is best shown in Fig. 9. Rod 18 (Fig. 7), is lifted by lever 7 (Figs. 4 and 9), and rod 18 *a* is lifted by lock 6; and the disk, carried on the shaft *b* (Fig. 9), is moved when the slots in the two rods have both been brought into the right posi-

tions to release pin *c*. This position of rods 18 and 18 *a* is shown in Fig. 5.

The withdrawal of a second staff at either station is impossible because the process above described cannot be repeated until a staff (the one just taken out) has been inserted in either the A machine or the B machine. If a second staff, at A, or a staff at B, be lifted to drum D *2*, which is on the same axis with wheel 2, this wheel, locked by its lower pin having made a half revolution and been stopped by lock 6, will prevent the drum from turning, and will thus keep the staffs in the machine; and the only way to unlock the wheel is by repeating the electrical operations before described. If these be attempted the effort will be futile, because the next current sent by either station will be of such polarity that magnets 360 and 88 will neutralize each other, and so will not hold up armature 4. The change of polarity was effected when the staff was taken out. When this was done (revolving wheel 2 one-half turn), wheel 1 was also revolved the same distance; and thus, by means of eccentric

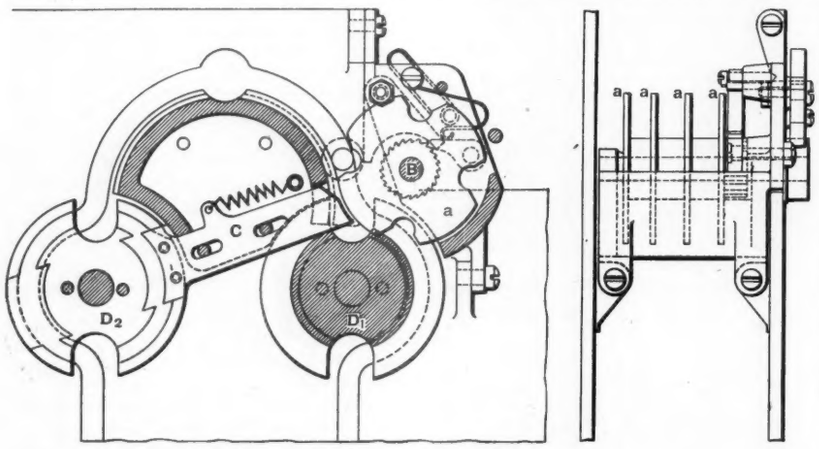


Fig. 10—Sectional View of Drums.

and rod *d* (Fig. 9), changed the path of the current by moving pole-changer 10 (Figs. 4 and 8) so that if the battery should be again connected to the line, the current would flow through magnet 88 in a direction opposite to that which it flowed before, and thus it would neutralize instead of reinforce the current through 360.

Replacing the staff in the machine (by passing it through slot D 1, Fig. 1) again changes the points 10 *a* and 10 *b* (Fig. 8), and a staff may be taken out as before. Staffs always come out through D *2*, revolving wheel 2; and always go in through D 1, revolving wheel 1; but either of these two wheels always revolves the other with itself.

If the staff is restored to the same machine from which it was taken, it restores the pole-changing points to the positions from which it had withdrawn them; if it is taken to B and put into the machine there, it moves the pole-changing points there so as to make them correspond with the changed position of the corresponding parts at A.

The operations that we have described may be summarized as follows: *A*, having a train that he wishes to send forward to *B*, presses the bell key 12 the prescribed number of times (called for by the bell code), which rings the bell 14 (Fig. 4) at *B; B* answers and holds in his bell key 12, which moves over the current, indicating needle 16 to the right (see Fig. 1). *A*, seeing this indicator standing over, at once turns the preliminary spindle handle 9 over to the right as far as it will go. He immediately releases it, and it returns automatically to its normal position. As soon as this occurs, the red disk 18 (Fig. 1) will show white as in Fig. 2. This indicates to *A* that the instrument is unlocked. He then moves a staff S through the vertical part of the slot into engagement with and revolving the drum D 2 and withdraws the staff at the circular opening at the uppermost point. When the drum D 2 is revolved the circuits are changed, throwing the instruments out of synchronism. At the same time, the staff-indicating needle 17 (Fig. 1) will move from "Staff in" to "Staff out." As soon as *A* has withdrawn the staff he presses in his bell key 12, which will move the indicating needle at B to "Staff out" (16 Fig. 1).

The staff is 6 in. long and ¾ in. in diameter. Staffs for different sections of the road have rings or wards of different shapes or sizes, so as to prevent the use of any staff in any machine except the two to which it belongs. The four steel disks a, a, a, a, Fig. 10, fixed to shaft B, constitute a lock to prevent the improper manipulation of the dogs C.

Machines of this design will probably soon be put in use on the Chicago, Burlington & Quincy's line across the Missouri River between Pacific Junction, Ia., and Plattsmouth, Neb.

Supreme Court Decision in Johnson Coupler Suit.

In a decision handed down last Monday by Chief Justice Fuller, in the case of Johnson against the Southern Pacific, the Supreme Court of the United States holds that all cars, including locomotives, should be equipped with uniform automatic couplers. The dining car, which was involved in this case, is declared not exempt from the requirements of the safety appliance law, even though it was empty and standing on a side track.

The accident out of which the suit grew occurred at Promontory, Utah, in 1900, when Johnson, a brakeman, was directed to couple the locomotive to a dining car which was standing on a sidetrack. (Johnson and the engine belonged on a freight and were called in merely to take the car to the turn-table and turn it around.) The engine was equipped with the Janney coupler and the car with the Miller, so, of course, Johnson had to go between the cars to couple with a link, and his hand was so badly mangled that amputation became necessary. He brought suit for damages, but both the Circuit Court for the District of Utah and the Circuit Court of Appeals for the Eighth Circuit decided against him. To-day's opinion reverses both these judgments and orders a new trial.

Chief Justice Fuller said that the purport of the law was to require that cars should be "equipped with couplers coupling automatically by impact, and which can be uncoupled without the necessity of men going between the ends of the cars." He held that the act requires that locomotives should be equipped with such couplers; "it was as necessary for the safety of employees in coupling and uncoupling that locomotives should be equipped with automatic couplers as it was that freight and passenger and dining cars should be, perhaps more so, as Judge Thayer suggests, since engines have occasion to make couplings more frequently. Manifestly, the word 'car' was used in its generic sense."

The locomotive in this case was equipped with an automatic coupler, as was the dining car, but the couplers on the two cars were of different types, and would not couple automatically, so as to render it unnecessary for men to go between the cars to couple them. This, it was held, did not comply with the requirements of the law, "whose object was to protect the lives and limbs of railroad employees by rendering it unnecessary for a man operating the couplers to go between the ends of the cars. That object would be defeated if these different kinds would not automatically couple with each other.

Of the contention that the dining car was not actually engaged in interstate commerce at the time of the accident, the Chief Justice said: "Confessedly the dining car was under the control of Congress while in the act of making its interstate journey, and, in our judgment, it was equally so when waiting for the train to be made up for the next trip." He held that the car could not be considered "empty" when in use, but said that "whether cars are empty or loaded, the danger to employees is the same."

Permanent Way for Fast Train Services.*

(*Continued from page 642.*)

On the continent, there is a tendency to change the process of manufacture of steel for rails; formerly scarcely anything but acid Bessemer was used, but to make this, cast iron manufactured out of ore from phosphorus was required. Such ore being scarce, most of the steel works have been led to adopt the Thomas or basic Bessemer process. Exceptionally there are also steel works where rails are made out of Martin basic or Martin acid steel.

The managements that used Thomas steel ten years ago have had plenty to complain about; metallurgists till then did not understand the process properly. It was thought that any cast iron, of any composition, was suitable for making Thomas steel, and the results obtained were poor. But subsequently, we think that the Thomas steel manufactured for rails was just as good as the Bessemer, and most engineers seem no longer to have any objection to Thomas steel. If, however, we are to believe in certain statistics, the general (?) use in Germany of Thomas steel is the cause of the more numerous rail fractures which occur there as compared with England. Now in the first place, is it true that in Germany there are more Thomas rails than Bessemer rails in actual use? Moreover, there is nothing conclusive about these comparative statistics applying to two countries where the climate, the working, the traction, the cross-section and the dimensions of the rails, their method of manufacture and the railroad system are so entirely different. Any comparison of fractures can only be made between rails of the same cross-section on lines of the same age and carrying the same amount of traffic. The North Eastern in England uses both Bes-

*Extract from a report prepared for the International Railway Congress, by Mr. Van Bogaert.

semer and Thomas rails, and the latter do not break more frequently than the former.

The Belgian State Railway system has 6,978 miles of rails on main lines; of which 870 miles are 104.83 lb. rails laid between 1888 and 1894; and 1,118 miles are 81.84 lb. rails laid between 1900 and 1903. During 1903, there were recorded 401 transverse fractures of 76.60 lb. rails or of rails of old sections, nine of 104.83 lb. rails, and five of 81.84 lb. rails. The annual traffic amounts to 37,293,000 train-miles. The 76.60 and 104.83 lb. rails are of Bessemer steel. Of the former, there are some more than 30 years old (1872), and the oldest break the most; of the 81.84 lb. rails, two-thirds are made of Thomas steel and one-third of Bessemer.

According to these statistics, in Belgium, on a system of about 2,485 miles, about one rail is broken per year per 6.2 miles of railroad, whereas in England only one rail is broken per year per 62.1 miles of railroad (in Germany one rail per 2.5 miles); Bessemer rails, however, are used in both cases and the cause is not Thomas steel. The favorable influence of heavy rails is also clearly shown, for it must be noted that there is most traffic on the lines with 104.83 lb. rails. In order to reduce the number of fractures of rails, it would perhaps be advisable, taking the lightness of the 76.60 lb. rails as compared with the heaviness of the rolling loads into consideration, to limit the time the 76.60 lb. rails are left in on main lines to a greater extent than is at present the case.

According to Haarmann, 82.65 lb. Thomas rails, put in on the Cologne-Hamburg line, near Osnabrück, in 1901, at the same time as the Bessemer rails, show about twice as much wear as the Bessemer rails; we have already seen that the Bessemer rails of that line show twice to three times as much wear as those of the French Northern. The Thomas rails show a wear of one millimeter per 25,000 trains; but although the chemical composition and the physical qualities of the Bessemer steel are given, we do not find those of the Thomas rails; they are probably made of soft steel or else rolled at too high a temperature.

The Bessemer rails at Osnabrück, to which we shall refer later on, have an ultimate tensile strength of from 44.83 to 46.67 tons per sq. in. at the crown and flange respectively, an elongation of from 17.1 to 10 per cent. and a contraction of area of from 41.4 to 24.4 per cent. The chemical composition per cent., is: silicon, 0.41; manganese, 1.04; phosphorus, 0.09; carbon, 0.44.

The descents from Ans to Liége have an average gradient of 2.8 per cent. over a length of two miles 855 yards, and a maximum gradient of 3.1 per cent. over a length of 1,312 yards, every day 30 passenger trains weighing 350 tons each, 65 goods trains weighing 650 tons each, 13 passenger locomotives weighing 103 tons each and 58 goods locomotives weighing 121 tons each run down these inclines. To the goods trains, ballasted wagons with slipper brakes are added; the rails on this downhill track become worn more than the rails on any other part of the system. It is of interest to compare the wear of the 76.60 lb. Bessemer and Thomas rails on this section; the Thomas rails were taken out in 1902 and replaced by Bessemer rails.

Observed Wear, in Inches.

Location.	After 18 mos. 76.60-lb. Bessemer rails.	After 19 mos. 76.60-lb. Thomas rails.
Above Aumônier	0.18	0.16
" Saint-Laurent ..	0.35	0.35
Below Saint-Gilles	0.43	0.45
" rue Nysten	0.43	0.47
" rue du Sauveur.	0.47	0.47

The agreement between the amounts of wear is remarkable and does not at all justify the opinion still held in some quarters that Thomas steel rails are inferior for wear to Bessemer steel rails. At the time when these rails were supplied, the specifications laid down a minimum ultimate tensile strength of 41.27 tons per sq. in. and a minimum elongation of 10 per cent. If any other railroads have made similar observations confirming or contradicting these conclusions, it would be of interest to inform the Congress of them.

Rolling the Rails.

We extract the following paragrapph from a note on the rolling of rails published by Mr. P. Pasquier, Engineer, in the *Revue Universelle des Mines et de la Métallurgie*, May, 1901, Liége.

"The physical work put in during the rolling process has no influence on the quality of the steel of the finished rail, as was formerly thought to be the case. Large ingots which have more work put on to them do not give better steel than small ingots; even hammering does not add anything to the quality of the steel. Coarse crystallization gives a metal of bad quality, and fine crystallization is a sign of good quality."

Mr. Sauveur (translated and annotated by Mr. Osmond) lays down the following propositions:

I.—Slow and undisturbed cooling, from a temperature equal to or above x (point b of Tchernoff), produces crystallization.

II.—Slow and undisturbed cooling, from a temperature below x, does not produce crystallization.

Corollary.—Steel sections finished at a temperature below x do not become crystalline in their structure.

III.—The temperature x varies with the chemical composition of the steel. The different impurities, carbon and phosphorus at least, lower x, although to a very different extent.

Corollary 1.—Carbon and phosphorus and probably all impurities, at least if present in certain proportions, increase the size of the grain.

Corollary 2.—The harder the steel, the higher the temperature at which the rolling can be completed without coarse crystallization.

IV.—The higher the temperature from which the steel is allowed to cool slowly and without further work being put on it, the coarser the grain for given chemical composition.

V.—The slower the cooling, the coarser the grain for a given composition.

Corollaries 4 *and* 5.—The grain of a finished section is coarsed at those points which were hotter when the rolling was completed and which were cooled more slowly.

VI.—The size of the grain is independent of the amount of work put on to the steel.

A Vignoles rail finished hot from the same heat as one finished cold is characterized by elongations of 15, 19 and 22.5 per cent. at the center of the head, the side of the head and the edge of the flange respectively, whereas the corresponding figures for a rail finished cold are 20.5, 20 and 21 per cent.

Mr. Pasquier has made experiments on the influence of the temperature of rolling on rails made out of the same bloom cut in half, the test pieces being taken from near the cut. He concludes that: "Any steel the rolling of which is finishesd either at a temperature above x or below y, will on testing give results which are the worse the further the temperature from those limits (y is a temperature which varies with the composition of the steel and gives the defect called cold-shortness)."

The defects due to these two causes (too hot or too cold rolling) are removed by reheating. Experiments have also shown that with well-made steel, physical work does not in any way improve the quality. In the case of double-headed rails, all that is necessary not to exceed the disastrous temperature x, is to reheat the blooms to the temperature just required to do the rolling properly; there are no thinner parts which cool too quickly and the rolling is easy. But Vignoles rails have the flange with less metal and thinner than the head. As one starts with a bloom of square section, the steel must be worked across from the flange to the head, and the flange must be prevented from cooling too much during the operation of rolling. It is therefore necessary as much as possible to avoid overheating the blooms, to roll very quickly and not to have too long bars; it is thus possible to roll at a low temperature without the flange becoming cracked. It is also advisable to increase the thickness of the flange of Vignoles rails.

The Kennedy and Morrison process consists in cooling the rail to a suitable temperature before putting it through the last pair of rolls. The temperature at which a rail should leave the rolls is the lower the greater the area of the cross-section of its head. It hence results that it is easier to roll a 72.57 lbs. rail without obtaining a coarse grain than a 100.79 lb. rail.

A 72.57 lb. rail must be finished at a temperature of about 860 deg. C. (1,580 deg. Fahr.) in order to obtain steel without coarse grain. To satisfy proposition V, the author proposes to cool the rails as quickly as possible by a current of air. The reporter would draw attention to the fact that, in order to make it unnecessary to work steel across from the flange to the head, it would be possible to cast ingots of trapezoidal section to roll Vignoles rails or even bull-head rails out of, and to make the blooms of that secton. It would also be desirable, as Mr. Pasquier states, to roll sections having thicker flanges, particularly in the case of heavy rails and of rails which have a small inclination of the surfaces on which the fishplates bear, in order to avoid any cold-shortness in the flange during rolling at the suitable temperature (between x and y) and at the same time avoid any coarse grain in the head. It is also advisable to use hard steel containing 0.5 per cent. of carbon which has only one temperature x, whereas steel containing less carbon has two or three lower than x.

Now although the 104.83 lb. rails of the Belgian State break much less frequently than the 76.60 lb. rails, on the other hand they have the disadvantage that the head more often becomes flattened out than with the lighter rails. But although this defect then makes it necessary to take out such a rail from the main lines, yet it presents no danger so far as the circulation of the trains is concerned. In America some railroads specify a maximum contraction of the rolled bars after they have been cut to length immediately after leaving the last rolls, in order to check the temperature the rolling is finished at. But this does not always prevent a coarse grain.

Liquation and Cropping of Ingots, Blooms and Bars.

We think that any specifications as to the cropping of ingots, blooms and rolled bars should vary with the purity of the steel, and consequently with any liquation effects. A special process (Sauveur) makes it possible to avoid these very injurious liquation effects almost entirely by casting into ingot moulds arranged in series; the steel flows down from the fifth to the last and continually reheats the heads of the ingots. It should therefore not be specified that at least 4 ft. 11 in. must be cut off from the end of the rolled bar corresponding to the head of the ingot; for this may be too little for impure steel in which considerable liquation has occurred and far too much for pure steel with little liquation or cast on the Sauveur system. Such clauses may have the effect of preventing the steel makers from improving as much as possible their manufacturing processes. In order to ascertain, with a given quality of steel, whether sufficient has been cut off the ends of the ingots, blooms or bars, it is advisable to make etching tests on the surface of rails. In case of any doubt, the microscopic examination of etched cross-sections may give more definite information;

but this is a laboratory method not yet used in ordinary inspection practice.

Chemical Composition.

In order to obtain tough and hard rails most suitable for resisting wear and tear, the chemical composition, in percentages, should be somewhere about as follows: Silicon, 0.1 or less; manganese, 1 to 1.2; carbon, 0.5; phosphorus and sulphur, less than 0.1. Haarmann proposes the same proportion of carbon as of silicon, from 0.2 to 0.5. (The English specifications place silicon on the same footing as phosphorus: not to exceed 0.1.) We have seen before that the rails with 0.2 to 0.5 of silicon on the line from Cologne to Hamburg become worn more quickly than rails of the same hardness on the French Northern. It is probably the bedplate which is one of the causes of the greater wear of the German rails; but in any case it is by no means proved that the great proportion of silicon beyond 0.1 reduces the wear. In order to arrive at any definite conclusion on the point, it would be necessary to make comparative trials on the same line, with rails hardened by carbon and with other rails hardened by carbon and silicon. We are inclined to think that rails hardened by means of silicon are more brittle than those hardened by carbon, and that it is for this reason that the English railroads seem to object to more than 0.1 per cent. of silicon.

Special Methods for Avoiding Blow-holes.

Ferro-silicon is added in a small proportion to steel in order to prevent blow-holes. Aluminum in the state of metal is also used successfully, but it is still rather expensive. Similar results are obtained with ferro-aluminum. It is also recommended to stir up fused metal before casting it; these are details for steel manufacturers to consider.

Mechanical Tests.

Many of the railroads are satisfied with drop tests and examining the fractures: they must show a fine grain. Others specify the steel by its ultimate tensile strength and elongation. There is a general consensus of opinion that the ultimate tensile strength of steel for rails should average 44.45 tons per sq. in. and should not be less than 41.27 tons per sq. in.; the elongation should be at least 10 per cent. When this is specified, the steel works (Bessemer as well as Thomas) generally supply rails having an ultimate tensile strength of between 43.18 and 45.72 tons per sq. in. and an elongation of from not less than 12 up to 17 per cent. In England, as a rule, an elongation of 15 per cent. is specified.

Summary and Conclusions.

Experience seems to prove that neither metal sleepers nor longitudinal sleepers are suitable for busy lines with fast traffic. The weight of rails tends to increase with the speed. Heavy rails have certain advantages over light rails; the track requires less maintenance and fewer renewals, the rails get worn less and break less.

With excellent rolling stock and well balanced locomotives, the necessity of using heavy rails is not so paramount.

Putting in the rails so that the web is vertical has more disadvantages than advantages.

It would be desirable to have a wider head and to have a flat rolling surface like the tire, so as to prevent the hollowing out of the latter by the mutual action of the two bodies in contact.

The minimum thickness of the head can be reduced to 1⅜ in.

By widening the head, the surfaces on which the fishplates can bear are increased; this reduces the excessive wear of the rail and fishplate surfaces in contact with each other, and consequently the deformation of the joint; for this same reason, the steel used for fishplates should be as hard as that used for the rails, contrary to the usual but erroneous practice.

The rails must be rolled at a low temperature (850 deg. C. [1,562 deg. Fahr.[).

Rails rolled at too high temperature, with a coarse crystallization, can be improved by re-heating to a suitable temperature.

In order to have steel of good quality, it is desirable, in the case of Vignoles rails, to roll sections with flanges thick at the edges, at least $^{23}/_{64}$ in.

Specifications laying down that part of the ingot, bloom or rolled bar that is to be cut off should not specify the exact amount to be cut off: the better the manufacture, the less liquation and piping is there and the less need to be cut off.

The chemical composition, in percentages, of rails should be about: Silicon, 0.1; manganese, 1 to 1.2; carbon, 0.5; sulphur and phosphorus, less than 0.1. Is it true that the resistance to wear is increased by increasing the proportion of silicon to 0.5 per cent.?

Steel having an ultimate tensile strength of at least 41.27 and even of 44.45 tons per sq. in. and an elongation of 10 per cent., is to be preferred for rails; for special track appliances, it is advisable to use even harder steel. Steel for the tires of locomotives and express rolling stock must be hard and tough; it should have an ultimate tensile strength of at least 44.45 tons per sq. in. and an elongation of 15 to 20 per cent.

Nickel steel is not used for rails and it is unnecessary to try it for European traffic; heavy rails of hard steel, rolled at a sufficiently low temperature, seem to be more economical even at places where there is an abnormal amount of wear and tear. Nickel steel might be tried for tires. Several systems of supported and suspended rail-joints are being tried; but sufficient time has not yet elapsed to make it possible to draw any conclusions.

Reducing the width of the expansion gap in the case of heavy long rails should be tried.

Welded joints are not to be recommended.

It is desirable to have long rails; 59 ft. is now a usual length; perhaps it would be possible to go to 78 ft. 9 in. if there were no difficulties of transport.

Proposed Moving Platforms Under Thirty-fourth Street, New York.

The accompanying illustrations show the location of, and plans for a proposed subway under 34th street, New York City, as submitted to the Board of Rapid Transit Railroad Commissioners by Messrs. Schmidt & Gallatin at a hearing on Nov. 29, 1904. It is proposed that a subway be built from First to Ninth avenues, as shown in Fig. 1, and used as a feeder for connecting all of the north and south elevated and surface lines with the new Pennsylvania Railroad terminal, to and from which it is expected the traffic will be exceedingly heavy. It is estimated that over 70,000,000 people per year will have to be cared for at this point.

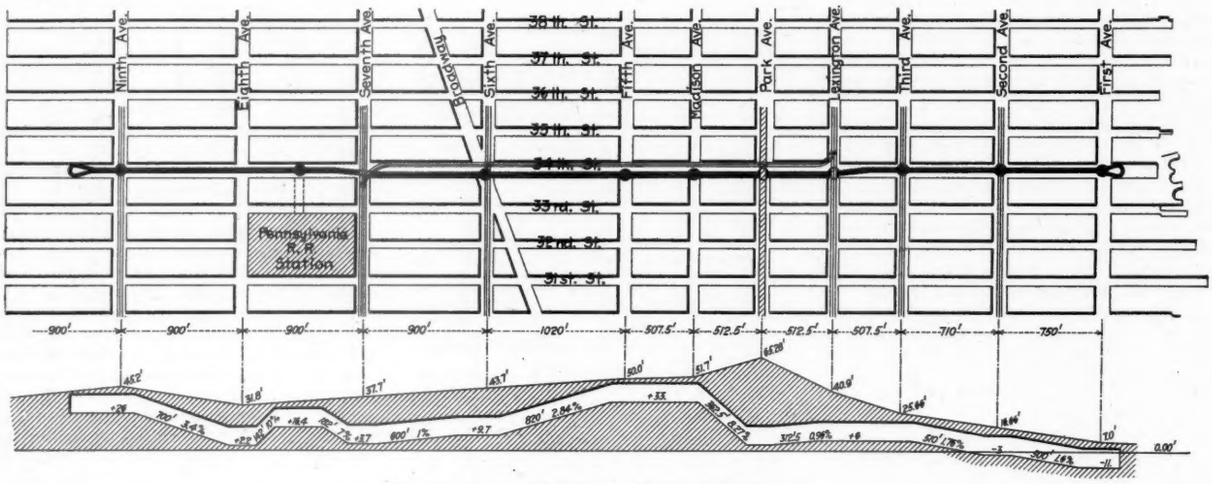


Fig. 1—Proposed Subway Under 34th Street.

The continuous train or moving platform as proposed, will have a capacity for delivering at a given point upwards of 50,000 seated passengers per hour. It is proposed to divide the subway by a partition, as shown in Fig. 2; one part of the platform moving eastward on one side, and one moving westward on the other side. This method is claimed to provide for more continuous circulation of the air than could be procured if the platforms moved in opposite directions in one large tube.

The system as proposed consists of an auxiliary platform, two "stepping" platforms and one platform fitted with seats, the whole really amounting to a continuous train. The driving mechanism consists of a number of 10 h.p. motors placed 75 ft. apart connected to shafts by means of chain drives; these shafts are mounted in boxes on

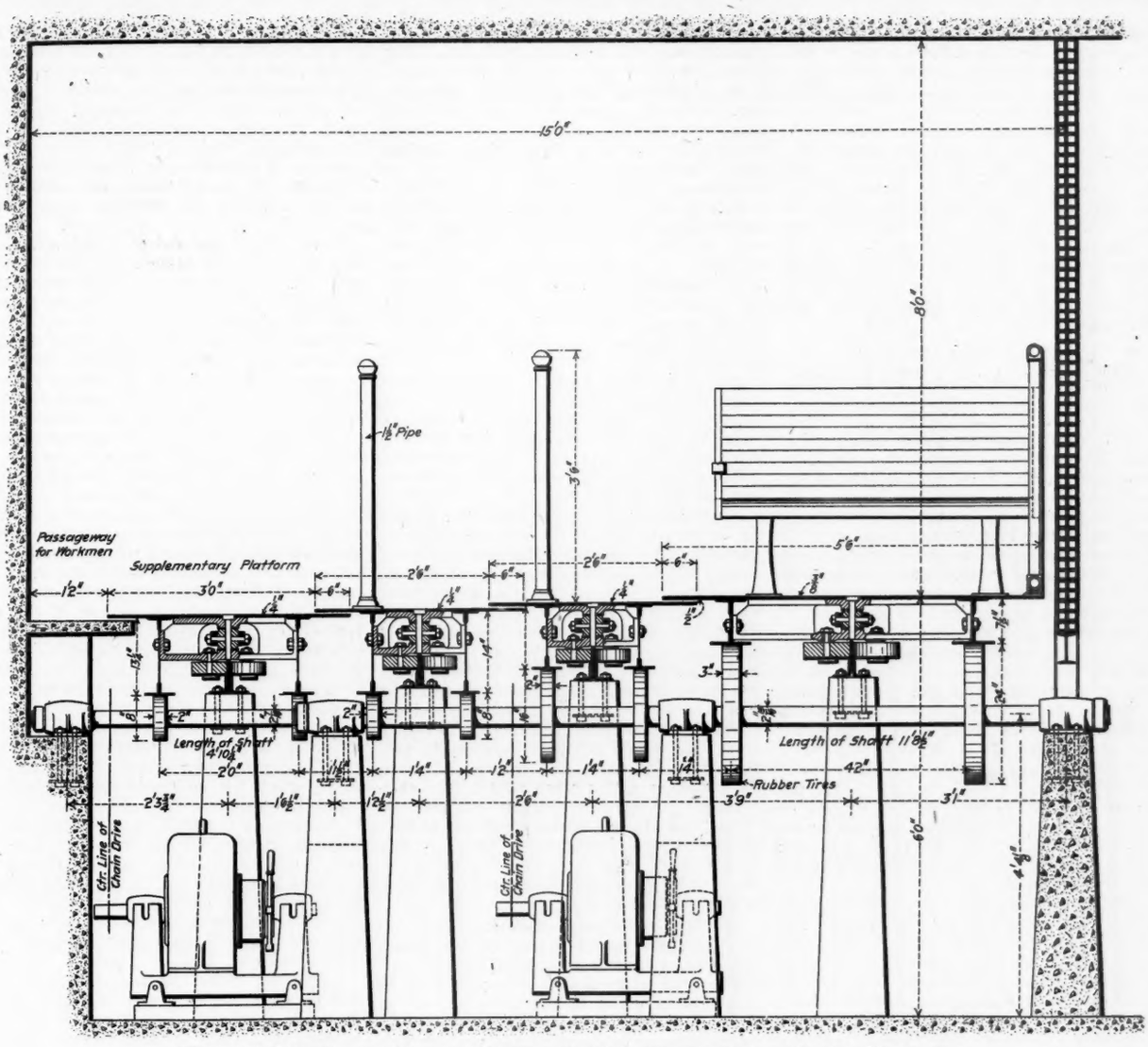


Fig. 2—Half Section of Proposed Subway Showing Arrangement of Moving Platforms.

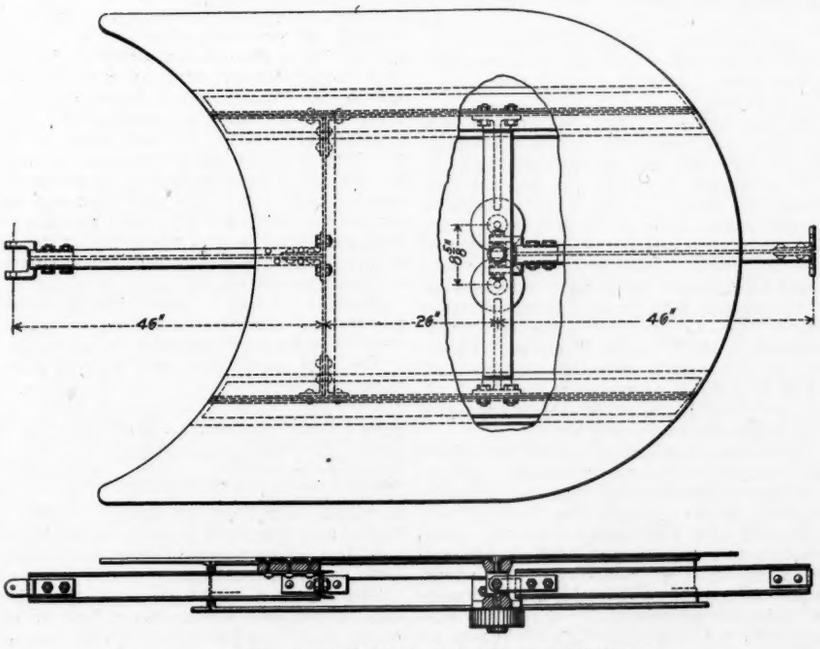


Fig. 3—A Section of the Moving Platform.

fixed foundations placed at about 2 ft. 9 in. centers. Each shaft carries three pairs of rubber tired wheels as shown.

The sections of the platforms are supported on these wheels and the wheels are of such a diameter that the platforms are actuated at speeds of three, six and nine miles per hour respectively. The auxiliary platform shown in the illustration is for use at night, or at times when for any reason it may be desirable to stop the main platforms, as for inspection. It is proposed to move this platform at a speed of three miles an hour. On the "nine-mile" platform, in addition to the seats, a walk is to be provided and a passenger who is in a hurry can board this platform and continue to walk. It is claimed that the power required to operate the moving platforms will be considerably lower than is now used in operating cars.

The relative dead load per seated passenger in cars and in the proposed moving platform is as follows: In the local subway service, 1,241 lbs. of dead weight must be carried for each seat provided, and in the Manhattan elevated six-car local service the dead weight per seat is 790 lbs., whereas it is claimed that the dead weight per seat on the moving platform will only be about 437 lbs., or practically a saving of two-thirds of the dead weight carried in the subway. Another assumed saving in power, as compared

with an ordinary train service, arises from the fact that there is a steep grade in East 34th street, but it is estimated that the effect of gravity upon the units descending will tend to counterbalance the pull upon those ascending. This assumes, however, that the friction at the turn is small, otherwise a perfect balance could not be obtained. The platforms are to be made up of sections and the method of connecting these sections together is clearly shown in the detailed illustration, Fig. 3. We are indebted to Max E. Schmidt, General Manager and Chief Engineer, of the Continuous Transit Securities Company, for the above information and illustrations.

Cylinder Clearance and Valve Events.*

BY O. W. YOUNG.

In the numerous papers on this subject that have appeared during the past year there is one phase of the question that seems to have been given but little attention, and, as it happens to be in the line of research that the writer is especially familiar with, this paper has been prepared for the purpose of inviting investigation to determine the limit of effectiveness attainable in the cylinders of a locomotive.

Is it not a fact that the modern locomotive to-day is taxed to its utmost to perform its daily work, and that requirements in the way of faster schedules and heavier trains, especially in passenger service, have outstripped the development of increased power in the locomotive? If so, it should be of first importance to produce an engine of sufficient capacity to haul its load to the terminal on schedule time, and of enough reserve to do this even when opposed by unfavorable weather and some unusual delays; and the cost of this service should be of second consideration.

Effective pressure on the piston is the power that pulls a train. The higher that pressure, the faster the train will run; and the heavier the train, the higher must be the piston pressure to move it. The limit of effectiveness at high speeds is fixed by the capacity of an engine to expel steam from its cylinders. Look at the fastest indicator cards you have been able to obtain and they will show a mean back pressure equal to or exceeding the mean effective pressure; and it is only by reducing this back pressure that the effective work can be economically increased.

One feature of the Stephenson link motion that is sometimes unfavorably criticised, but which, in my opinion, is one of its most essential elements for producing high speed, is the early release its motion causes for the shorter cut-off. At what period of the stroke during high speed does exhaust occur? Is it not between the point of exhaust opening and the end of the stroke? The indicator very rarely shows a lower back pressure in mid-stroke than at the beginning. On the contrary it is usually higher, and it is very evident that the advancing piston is obliged to push out whatever pressure of steam remains in the cylinder at the moment of its return stroke, as it is impossible for this steam to escape with greater rapidity than that of the decreasing cylinder volume caused by the moving piston. In order to secure a low back pressure during the entire stroke a low initial back pressure is very essential, and to secure this an early and free pre-release must be provided. The point of exhaust closure for compression should then be delayed sufficiently late to prevent the terminal pressure from exceeding that of the steam chest.

*A paper presented to the December meeting of the Western Railway Club.

The accompanying indicator cards are imaginary diagrams and are presented merely to illustrate the points sought to be made. They are not claimed to be absolutely correct in every respect, but have been prepared with considerable care and are drawn to conform to known effects of the various conditions considered, and are thought to be sufficiently close to what would actually occur in the premises, that, while figures might vary slightly in actual tests, their relative differences would remain practically unchanged. They are all supposed to be taken from cylinders 20 in. x 26 in., drivers 80 in. above the rail, revolutions per minute 250, which is equivalent to about 60 miles per hour, and the initial pressure is assumed to be 200 lbs.

Card No. 1 shows a steam distribution produced by a well-designed Stephenson link motion, with 6 per cent. cylinder clearance, when an engine is cutting off at 6 in. The mean effective pressure is 60 lbs.; mean back pressure or negative work 21 lbs., or 35 per cent. of the effective work.

No. 2 shows what would occur if a longer cut-off were used in an attempt to get greater power into the cylinder. This position would obtain wider port openings for admission, but, owing to the rapidly increasing piston speed soon after the beginning of the stroke, practically the same wire-drawing would take place, causing a large drop in pressure at the point of cut-off, as compared with the initial pressure, and, while some gain in power would be admitted, the later release openings, together with the higher pressure at release, would probably overtax the nozzle capacity to expel sufficient steam during pre-release to secure a low initial back pressure, and, in consequence, the back pressure would be high, but the later exhaust closure would prevent compression from raising higher than initial pressure. The negative work under these conditions is 39 per cent. of the effective work.

No. 3 is based upon the supposition that sufficient port openings were secured to admit steam up to the point of cut-off with very slight drop in pressure. It would then be found that, owing to the large volume of steam admitted, release would not be sufficiently early to complete the exhaust during pre-release, and a high back pressure and excessive compression would result. It would seem, therefore, that an attempt to provide greater freedom of admission during short cut-off would result disastrously unless greater freedom of pre-release were also provided.

In No. 4, the cylinder clearance is supposed to have been reduced from 6 per cent. to $2^4/_{10}$ per cent. Owing to this decrease in volume of steam confined in the clearance space, the expansion line would drop to a greater extent than in the first three cards, and the pressure at release would be lower, and, in consequence, a lower back pressure could be expected, but an early exhaust closure combined with small clearance space would cause the terminal pressure of compression to be so high as to probably exceed the initial pressure. Lengthening the cut-off as in card No. 5, or providing more free admission as in No. 6, would simply aggravate the defects shown in card No. 4.

From the cards so far considered, it is apparent that the most economical combination is produced by No. 1; the most powerful is No. 2, but at a greater loss through negative work. No. 7 supposes a 6 per cent. clearance, a late release and late compression, with the usual wire-drawing during admission. As previously explained, the moment of exhaust and practically the whole time allowable for exhaust during high speeds, occurs during pre-release, and, if exhaust opening is abnormally delayed until nearly the end of the stroke, a high back pressure is sure to remain during the return stroke, provided sufficient steam has been admitted into the cylinder to accomplish especially effective work, and, with generous clearance space, very late compression would not entrap sufficient steam to raise the terminal pressure of compression to an economical point, and the boiler would have to supply steam for filling the clearance space each stroke.

No. 8 in a longer cut-off would raise the back pressure still higher, but there would be less drain upon the boiler for raising the terminal clearance pressure during pre-admission. No. 9, with less wire-drawing during admission, would produce ideal results, excepting that the back pressure would be excessive. Card No. 10 has $2^4/_{10}$ per cent. clearance, and, owing to the usual drop in pressure during admission, and the lower expansion line, on account of the small clearance volume, has sufficiently low pressure at its late release to exhaust to a fairly low back pressure, and, under these conditions, its late exhaust closure causes a very nice showing in the negative work of compression, and the entire negative work is but 21 per cent. of the effective work; but if, as in card No. 11, a greater volume of steam were admitted, the insufficient length of the period of pre-release would then cause a negative work equal to 36 per cent. of the effective work, and No. 12, with more liberal port opening while admitting, would result practically the same as shown in No. 11.

The valve events shown in this group (Nos. 7 to 12 inclusive) would teach that No. 10 should give excellent results in the way of economy, but no especially high degree of efficiency could be effected in the way of high speed, as it would be impossible, under these conditions, for an engine to free itself of unusually large volumes of steam. In the way of efficency, No. 9 would accomplish some very effective work, but at considerable cost per unit of work done on account of the high percentage of loss from back pressure.

In No. 13, with 6 per cent. clearance, not only are the valve events supposed to be changed, giving a slightly earlier exhaust opening, and later exhaust closure than in the first group, but the area of the exhaust port during pre-release is supposed to be increased, and a slight loss is here shown on account of the atmospheric line being reached before the end of the stroke. No. 14 in a longer cut-off, entailing later release and earlier compression, produces a strong card, and, considering its power, a very economical one; but No. 15, in a short cut-off and high pressure up to the point of cut-off, shows not only the highest mean effective pressure of any, but the percentage of loss is the least, and this card appears to be as near ideal as it is practicable to obtain in locomotive practice, if exceptional power at high speed is desired.

Cards 16, 17 and 18 show that the valve events, now under consideration, are not so well suited to small clearance.

The best card from each of the three groups shows:

	No. 1.	No. 10.	No. 15.
Mean effective pressure	60	66	91
Mean back pressure	21	14	13
Percentage of loss	35	21	14
Indicated horse-power	309	340	469
Lbs. of steam per hr. per i.h.p.	19.6	18.9	17.9

It will be seen from the above that No. 15 is not only the most powerful card, but it uses less steam per horse-power developed than any of the others.

The objection might be made that this card caused considerable loss of heat on account of the high pressure at the point of release, but if this steam has been held in the cylinder as long as it is practicable to

hold it, and the atmospheric line is not reached during pre-release but at the end of the stroke, there is no loss that could be avoided without entailing a greater loss from back pressure if the steam were expanded further before release. Another thing that must be remembered is that in designing valve motion for a locomotive, the effect of the exhaust upon the fire must be taken into account, and the higher the pressure at exhaust, the larger nozzle becomes practicable, and this has a beneficial influence upon the back pressure.

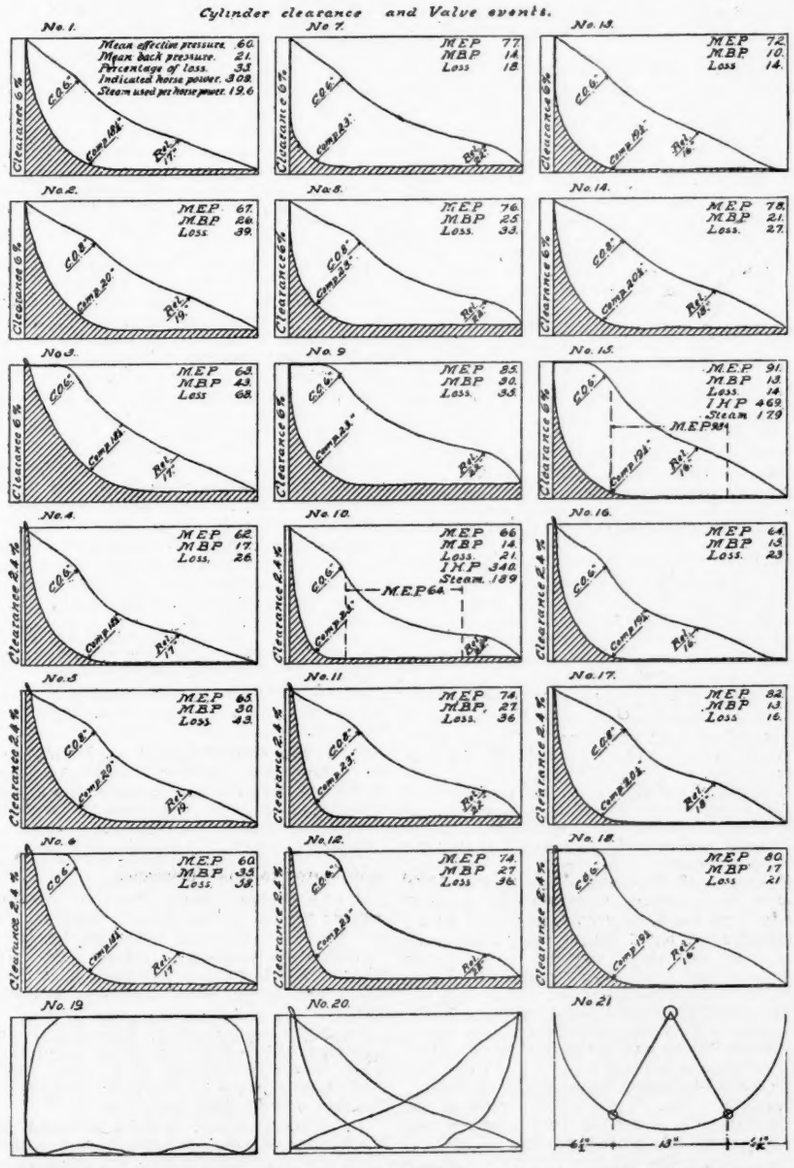
It is sometimes claimed that a reduction in clearance space is in the interest of economy. Now, the amount of clearance space is merely a matter of expediency, and must be determined by the events of the particular valve motion which is to be used, and, provided the terminal pressure of compression equals but does not exceed the initial pressure, there is no choice from an economical standpoint between large and small clearance. It would cost more to compress a large volume into a large space than a smaller volume to an equal terminal pressure into a proportionately smaller space, but the reaction of the larger volume in the way of sustained pressure upon the piston during its return stroke would be greater for the larger volume in exactly the same ratio as was its loss during compression.

To illustrate this point, the mean effective pressure has been measured on cards Nos. 10 and 15, for the middle half of the stroke, with the result that for card No. 10, with a given mean effective pressure of 66 lbs. during the entire stroke, the mean effective pressure during the middle half of the stroke, which practically embraces the period of expansion, is 64 lbs. or 98 per cent. of what it was for the whole stroke; while for card No. 15 with a given mean effective pressure of 91 lbs. that during expansion is 98 lbs., or 110 per cent.; and when it is remembered that it is during the middle half of the stroke that the crank leverage is greatest (see Fig. 21), it will be seen that the larger clearance exerts a very useful crank effort at the time it is most needed.

An analysis of the retarding effort of the negative work shows that the term "mean back pressure" does not tell the whole story. Cards Nos. 10 and 15 each show nearly the same mean back pressure, but, while that of No. 15 is practically all included in compression at that point of the stroke when the crank leverage is shortening, the back pressure of card No. 10 is distributed during the entire stroke, and exerts a greater retarding effort as compared with that of No. 15, as a larger percentage is against the crank during the middle portion of the stroke when its effect is more disastrously felt. It is better, therefore, to secure the lowest possible initial back pressure so as to confine as much as possible of the negative pressure to that period between exhaust closure and the end of the stroke. Card No. 15, then, appears from every standpoint to represent the best that can be attained, and the effort should be to approach as nearly as possible such conditions.

In an effort to hasten exhaust opening and delay exhaust closure, care must be taken not to give the valve too much inside clearance, or it will result in steam blowing through from one end of the cylinder to the other at a certain point of the valve travel, and cause such lines as are shown in the back pressure and compression lines in cards Nos. 19 and 20.

While the foregoing conclusions are drawn from imaginary conditions and are to a certain extent of a theoretical nature, it is only fair to state that the writer has applied this theory to actual practice; and, while conditions as perfect as those shown in card 15 have not yet been secured, very gratifying progress in that direction has been made, and he believes it feasible to attain as perfect a steam distribution as is there shown, for the idea has not yet been carried to the limit of its capabilities.



Theoretical Indicator Diagrams Showing the Relation between Cylinder Clearance and Valve Events.

Train Accidents in the United States in November.[1]

bc, 1st, Chicago, Rock Island & Pacific, Laddsdale, Iowa, butting collision between a work train and a freight engine; two laborers killed and five injured, one of them fatally. The freight engine after the collision ran backward five miles to Eldon.

bc, 2d, Louisville & Nashville, Livingston, Ky., butting collision between a northbound regular freight train and a southbound extra freight, wrecking both engines and several cars. One engineman and one fireman were killed. There was a dense fog at the time.

bc, 2d, Augusta, Ga., a switching engine of the Charleston & Western Carolina collided with a switching engine of the Central of Georgia, causing the death of one employee and the injury of another.

unx, 2d, Missouri, Kansas & Texas, Moran, Kan., passenger train No. 21 was derailed and the engine was overturned. The fireman was killed and the engineman and a mail clerk were injured.

xc, 4th, Pennsylvania road, Portage, Pa., passenger train No. 19 collided with an empty engine, and three employees were injured. There was a dense fog at the time.

dn, 4th, Grand Trunk, Cassopolis, Mich., a freight train was derailed at a derailing switch and the engineman was badly injured.

†unx, 4th, Atlanta, Knoxville & Northern, Ball Ground, Ga., a freight train was derailed on a trestle bridge and fell into a

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

pond. Two men were killed and three were injured.

eq, 4th, Baltimore & Ohio, Mansfield, Ohio, a passenger train was derailed by the failure of the tire of a wheel of the engine, and the engineman was killed. Two passengers were slightly injured.

xc, 5th, Bessemer & Lake Erie, Greenville, Pa., a special train carrying officers of the road collided with a freight train which appears to have been on the main track at a meeting point without right, and the engine of the special and two freight cars were damaged. Two trainmen were injured.

dn, 6th, 3 a.m., Norfolk & Western, Radford, Va., a freight train was derailed at a derailing switch and the engine was overturned. The engineman and a brakeman were killed and the fireman was injured.

unf, 6th, New York, Susquehanna & Western, Middletown, N. Y., passenger train No. 3 was derailed by a malicious obstruction and three passenger cars were overturned. The conductor was injured.

xc, 7th, 10 p.m., Boston & Albany, Springfield, Mass., a freight train broke in two on a descending grade, and the rear portion afterward ran into the forward one, wrecking several cars. An unknown man was killed and two brakemen were injured.

dr, 8th, St. Louis, Iron Mountain & Southern, Alexandria, La., a freight train was derailed by a loose rail, and the engine and eight cars were overturned. Three employees were injured.

8th, Chicago & Eastern Illinois, Lyford, Ind., a freight train of the Evansville & Terre Haute collided with a work train of the Chicago & Eastern Illinois, overturning a car in which were 40 laborers. Three of these men were killed and 27 were injured. There was a dense fog at the time. It is said that the freight train was running at uncontrollable speed because it had broken in two and the engineman was trying to keep the front portion moving fast enough to avoid having it run into by the rear portion.

bc, 9th, 2 a.m., Southern Railway, Selma, Ala., butting collision of freight trains, one of which it is said was on the time of the other in consequence of the misreading of an order. One of the engines was overturned and five trainmen were injured.

dr, 9th, Northern Pacific, Wadena Junction, Minn., an eastbound passenger train was derailed and the two rear cars ran against a freight train standing on an adjoining track. Three passengers were injured. The derailment is said to have been due to a defective switch.

dn, 9th, Erie road, Orange, N. J., a passenger train was derailed by running over a misplaced switch and on to a turn-table, from which the engine fell into a meadow some feet below the track. A boy stealing a ride on the rear end of the tender was killed.

unx, 9th, International & Great Northern, Malone, Tex., a freight train was derailed and several cars were wrecked. One man was killed.

unx, 9th, St. Louis, Iron Mountain & Southern, Pollock, Ark., a freight train was derailed and the engine and eight cars were wrecked. The engineman and fireman were injured.

dn, 10th, Erie road, Susquehanna, Pa., a freight train drawn by two engines was derailed at a misplaced switch and one of the engines fell down a high bank into the river. The engineman and fireman were injured.

*rc, 11th, Lake Erie & Western, Beaver Dam, Ohio, passenger train No. 2 ran into the rear of a preceding freight, wrecking the caboose and three cars, which took fire and were burnt up. The fireman was injured.

dr, 11th, Southern Railway, Cochran, Ga., passenger train No. 14 was derailed in consequence of faulty track, and several passenger cars were overturned; 13 persons were injured. The accounts appear to indicate the existence of some evidence that the rails had been maliciously tampered with.

unx, 11th, Missouri, Kansas & Texas, South Mound, Kan., the tender of the engine of a passenger train was derailed while running at full speed, and the engine and part of the cars were ditched. The fireman was killed and eight passengers and one trainman were injured.

bc, 12th, 1 a.m., Union Pacific, Azusa, Wyo., butting collision between a westbound passenger train and an eastbound fast freight, wrecking both engines and many cars. Six trainmen, two postal clerks, one express messenger and four other persons were killed, and 20 or more were injured. All of the men riding on the engine were killed. The line is straight at the place of collision and the only explanation of the failure of either engineman to stop when he saw the headlight of the other is that each supposed the other to be standing on the side track at Azusa station. An order had been sent to the freight that the passenger train was running 1 hour 30 minutes late, but this order, it is said, was taken to read 1 hour 50 minutes.

xc, 12th, 2 a.m., Baltimore & Ohio, Boyds, Md., collision between an eastbound and a westbound passenger train, one of which was entering a side track. One sleeping car fell down a bank. Ten passengers and two trainmen were injured.

unf, 12th, Southern Railway, Cleola, Ga., a passenger train was derailed by running over a horse, and crossed a trestle bridge on the sleepers.

bc, 13th, Yazoo & Mississippi Valley, Peyton, Miss., butting collision of freight trains, wrecking both engines and three cars. One fireman was killed and one engineman injured.

dn, 13th, Terminal Railroad of St. Louis, St. Louis, Mo., an eastbound passenger train of the Wabash Railroad was derailed while running over a curve at high speed and the engine was overturned. The engineman was killed and the fireman and five passengers were injured. It is said that the train was running at the rate of 60 miles an hour through a curve of 10 deg.

xc, 14th, Chadd's Ford Junction, Del., a freight train of the Philadelphia, Baltimore & Washington broke in two on a grade and several cars ran back down grade into the head of a passenger train standing near the crossing of the Philadelphia & Reading. The engine of this train was overturned and the passenger car was knocked back against the engine of a passenger train of the Philadelphia & Reading, standing on the crossing, pushing that down a bank. One passenger was killed and three others were injured.

†rc, 15th, Philadelphia & Reading, Silver Creek Junction, Pa., a locomotive ran into the rear of a preceding passenger train occupied by miners, crushing the rear car. Six of the passengers were injured, two of them fatally.

*xc, 15th, Denver & Rio Grande, Vallie, Colo., collision of two freight trains at a meeting point, one of them being at the time partly on the side track and partly on the main line. One engine and several cars were wrecked and the wreck took fire. Two trespassers were killed.

dn, 15th, Pennsylvania road, Brownsville, Pa., a switching engine was derailed at a misplaced switch; engineman killed and the fireman and one brakeman injured, the former fatally.

*rc, 16th, Alabama & Vicksburg, Bovina, Miss., a freight train ascending a grade was run into at the rear by a following passenger train and the caboose and one freight car were wrecked. The wreck took fire from the engine and the combustible portion of it was burnt up. Three employees were injured.

†rc, 16th, Pere Marquette, Elmdale, Mich., passenger train No. 34, standing at a junction, was run into at the rear by following passenger train No. 6, in consequence, it is said, of a misplaced switch. The rear car of the standing train, a parlor car, was badly damaged. Two passengers and one trainman were killed and six passengers and two trainmen were injured.

bc, 16th, Chicago, Rock Island & Pacific, Chickasha, Ind. T., butting collision of freight trains, wrecking both engines and several cars. Six trainmen were injured.

unx, 16th, 4 a.m., Atchison, Topeka & Santa Fe, Ardmore, Ind. T., passenger train No. 5 was derailed and the engine was overturned. The engineman was killed and the fireman and one mail clerk were injured.

xc, 17th, Cleveland, Cincinnati, Chicago & St. Louis, Union City, Ind., a freight train switching in the yard became uncontrollable and the caboose and several cars were pushed into the head of a passenger train standing on a side track. Two trainmen were injured.

dr, 17th, Cincinnati, Hamilton & Dayton, Williston, Ohio, a freight train was derailed by a loose rail and the fireman was killed.

dr, 17th, Cincinnati, Hamilton & Dayton, Williston, Ohio, a freight train broke through a trestle bridge and the engine and several cars were wrecked. The engineman was killed and two other trainmen were injured.

unx, 17th, Yazoo & Mississippi Valley, Memphis, Tenn., the two rear cars of a passenger train were derailed at a switch and overturned. A man at work on the track was injured.

*rc, 18th, Erie road, Port Jervis, N. Y., a freight train was run into at the rear by a milk train, wrecking the caboose of the freight, which took fire and was burnt up. The conductor of the freight train was burnt to death and two other trainmen were injured.

bc, 19th, Wabash road, Bement, Ill., butting collision of passenger trains, due to a misunderstanding as to the point in the yard where the two trains were to meet. Five employees and 20 passengers were injured, most of them slightly.

†*rc, 20th, Baltimore & Ohio, Wyland, Pa., a freight train standing at a water tank was run into at the rear by a following freight, and the caboose and several cars were damaged. The caboose took fire and was burnt up; and in it two drovers were killed, one of them being burnt to death.

unx, 20th, Washington & Columbia River, Hunt's, Wash., several cars of a freight train were derailed and wrecked and two tramps were killed.

*rc, 22d, 5 a.m., St. Louis, Iron Mountain & Southern, Swifton, Ark., a freight train entering a side track was run into at the rear by a following passenger train, making a bad wreck. The fireman was killed and the engineman, two other trainmen and eight passengers were injured. The wreck took fire and three passenger cars and 10 loaded freight cars were burnt up. Four passengers were severely burnt.

rc, 22d, Yazoo & Mississippi Valley, Lake Cormorant, Miss., a freight train ran into the rear of a preceding freight, and six trainmen were injured. There was a dense fog at the time.

xc, 23d, St. Louis & San Francisco, St. Louis, Mo., passenger train No. 26 ran over a misplaced switch and collided with a freight car standing on the side track. Three trainmen were injured.

dr, 23d, Dry Fork Railroad, Harman, W. Va., a passenger train was derailed by a broken rail and two passenger cars were overturned. Of the 20 passengers in the cars nearly all were injured, but only one seriously.

xc, 24th, Pennsylvania road, McGarvey's, Pa., two empty engines, coupled together, running at high speed on a descending grade, collided with a switching freight; two employees killed and two injured.

eq, 24th, 7 p.m., Cincinnati, New Orleans & Texas Pacific, High Bridge, Ky., a freight train was derailed by the breaking of the axle of a freight car; and one of the two engines propelling the train (which engine was back of the car on which the break occurred) was derailed, together with nine other freight cars. The engineman was killed and three other trainmen were injured.

dn, 24th, Iowa Central, Glenville, Minn., a freight train consisting of an engine and three cars was derailed at a point where track repairs were in progress; and the engineman and fireman were injured.

*o, 26th, Atchison, Topeka & Santa Fe, Pontoosuc, Ill., the locomotive of a freight train was wrecked by the explosion of its boiler, and the station building was damaged and set on fire. The fireman and one

brakeman were killed and the engineman was injured.

unx, 27th, Mobile & Ohio, Columbus, Miss., passenger train No. 4 was derailed and the cars fell down a bank; 35 passengers injured.

dn, 29th, New York, Philadelphia & Norfolk, Pocomoke, Md., a southbound freight train ran on to the drawbridge spanning Pocomoke river when it was not locked in position, and ran most of the length of the bridge on the sleepers. One of the two bridge attendants, in the excitement of his efforts to stop the train, was run over by the engine and killed. It is said that the engineman of the train disregarded a stop signal.

The Great Western Motor Omnibus Services.

BY W. B. PALEY.

It is well-known that the Great Western, almost alone so far amongst British railroad companies, has made a determined effort to meet the growing competition of road motor vehicles, literally on their own ground. What this competition will really lead to no one can possibly yet foresee, but in a country of small distances it is decidedly a thing to be reckoned with. The principal object is to develop districts adjacent to, but not on, the railroad, in which local enterprise has so far failed to provide facilities for getting to the trains that a hopeless condition of stagnation, not to say retrogression, has resulted. A railroad company can undoubtedly supply these with better prospects of success than private parties acting independently. In some cases the Great Western has not hesitated to compete with its own line, where the road motors could tap traffic which the railroad could not; in fact, its policy has been marked with boldness, originality, and success. Some of the services are mainly for summer tourists, one or two others have not answered expectations, but it is understood that the company is well satisfied with the experiment as a whole.

The commencement of the system was made in August, 1903, at the height of the tourist season in Cornwall. A motor waggonette, with a light roof overhead and driven by a 16 h.p. four-cylinder Milnes-Daimler petrol engine, was put on between Helston station and The Lizard, the promontory well-known to Atlantic voyagers to Plymouth or Southampton. The wagonettes had gear transmission, solid rubber single tires, and carried 22 passengers. A reduced service was carried on throughout the winter, a mail omnibus performing part of it, with a trip once each way daily. The length of the journey is 11 miles, done in 75 minutes, at a fare of 1s. 6d. (37 cents). Very little population exists in the neighborhood served, nor does the road go through, but only near to, the few villages on the way. There is a good hotel at The Lizard, and at many of the small coves or bays farmers, fishermen and others take in lodgers. Many people like quiet, cheap places for their holidays, and the extraordinary mildness of the Cornish climate in winter is very favorable for invalids. This year the Helston and Lizard service was again increased for the summer traffic, being raised on July 1 to five trips each way, on week-days only. Omnibuses with room for luggage were added, in addition to the motor cars, as it was found essential that visitors should be able to take their necessary belongings with them. Lower fares were charged by the luggage busses, which took 90 minutes en route. They made two trips each way daily, the motor car two, and the mail car one, all five trips being available for passengers. The first up journey of the motor car in the morning, and its second down trip, were in connection with the fast train that ran between Plymouth (North Road) and Paddington, 245¾ miles, in 266 minutes without a stop. Naturally, however, the efficiency of such a service depended not a little upon the state of the road, and this was distinctly bad. The local authorities refused to properly maintain it, and with the close of the tourist season the whole service has been withdrawn until further notice. By a curious chance the four vehicles used were destroyed by fire at Helston the night before the running ceased. In other parts of Cornwall the Great Western's policy has been welcomed by those concerned in its efficiency. From Penzance, the terminus of the railroad in the west, so many as five different services of motor omnibuses were running during last summer, three of which are still in operation, though not with the same frequency.

The Penzance services still running consist of a short one between the town and its suburb of Newlyn, every half-hour in each direction all day; about 10 minutes ride at a fare of 3d (6 cents). In the opposite direction a motor bus leaves Penzance station for Marazion every hour from 8 a.m. till 8 p.m., except at 9 a.m. To far as Marazion station, about 2½ miles, this service is parallel to and in direct competition to the railroad, but the busses go on another mile to the town named and thus accommodate the public better than the railroad alone can do. The fare is 4d (8 cents); time taken about 15 minutes. On July 1 a motor bus began running between Penzance station and the small town St. Just, seven miles westward, and about four miles north of the Land's End. Five trips were made each way daily, two on Sundays and an extra late one on Thursdays and Saturdays, the time taken being one hour and the fare 1s. (25 cents). The service has been increased, from Oct. 3, to seven trips each way on week-days, the Sunday and extra late services being withdrawn.

In the eastern portion of Cornwall a motor omnibus was started during the summer from Saltach station to Collington, Albaston and Gunnislake. Two busses are now used; the fare is 1s. 3d. (30 cents). The time taken 90 minutes. On August 22 the company started a motor-car between Newquay, a small North Cornwall sea-side place reached by the railroad, and Quintrell Downs. Four runs were made each way, taking 25 minutes, at a fare of 6d. (12½ cents). The car filled up the intervals by running nine trips to the golf links and East Pentire and back, the fare being 3d. (6 cents). This was a purely summer service and is not now in operation.

On Sept. 12 a motor bus began running between Plymouth (Millbay) station and Roborough village, on the Tavistock road, six or seven miles distant. Three trips a day are made to Roborough and back, taking 37 or 38 minutes, besides two other trips to Crownhill Barracks, and one to the George Hotel, these places being not so far as Roborough. On Wednesdays and Saturdays the two afternoon runs are prolonged to Roborough Rock, some nine miles, or 55 minutes journey from Plymouth, and on Sundays the service consists of two journeys to the Rock, at 2.30 and 6.30 p.m. Just beyond the village, and at the Rock, the visitor will have an opportunity of inspecting the disused Dartmoor Railway of 1826, described in the *Railroad Gazette* of Dec. 19, 1902. The motor bus used is of a type the company much favor, with seats for two alongside the driver, then an open-sided compartment seating eight, and a closed one for 10, the last being entered from the rear. Smoking is allowed on the front or middle seats, the latter are hinged and can be let down if not wanted, so as to make room for a reasonable quantity of luggage. Small parcels go on the roof. The vehicles weigh three tons, and have double solid rubber tires on the driving, and single on the leading wheels; Milnes-Daimler engines of 16—20 h.p. A jack is carried. The fare from Plymouth to Roborough Park is 1s., and to the outskirts of the town the bus competes with the corporation tramways. The lack of traveling facilities on this side of the town has retarded its development very much hitherto, horsebusses at long intervals toiling up the long rise having been the extent of them. The motor leaves these far behind and is usually full, and over-full, of passengers. Tickets of railroad type are issued on the busses, numbered but not dated.

West of Plymouth a motor bus has been running since July between Yealmpton station, the terminus of a branch line, and the small town of Modbury, some four miles farther on. At present there are five trips each way on week-days, with an extra late trip on Thursdays and Saturdays, and two on Sundays. Twice daily, and once on Sundays, however, the trips are prolonged to and from Plymouth, about seven miles more, the journey taking 80 minutes, with eight regular stops and as many more, of course, as may be necessary. The single fare to Modbury is 1s. 3d. (30 cents), return tickets 2s. (50 cents), which are available going back either throughout by bus or by rail by Yealmpton and bus onward. The through busses obviously compete with the railroad, touching it at four different places, but they enter and leave Plymouth quite another way. Another bus is run over the same ground by the South Hams Motor Company; in fact, the accommodation between Plymouth, Yealmpton and Modbury is now more likely to be too great rather than too little.

A third Devonshire bus service of the Great Western's is between Torquay and Paignton, a trip of about 3½ miles. Here again they compete with their own railroad, crossing it, in fact, twice. But Torquay station lies so far from the center of the town that you are half way to Paignton when you have reached it, and all sorts of miscellaneous vehicles have done most of the traffic The bus used is different from the others, being a big machine by Milnes, of Hadley, Thropshire, with Shrewsbury-Challiner tires, carrying, inside and out, 36 passengers. It leaves each end hourly, 12 times a day, but does not run on Sundays. Four pence (8 cents) is charged to or from the Promenade at Paignton, the journey taking 20 to 22 minutes. Other parties also run a motor vehicle over the same route. Tickets of the tramway sort are issued.

Motor busses have been running since March 31 from Slough to Beaconsfield, seven miles north. This little town will be on the new line from London to High Wycombe, which at present is not open beyond Greenford; and has no other railroad connection. Other Great Western stations are nearer to it than Slough, but a fairly populous district, quite capable of development if rendered accessible, lies between the two points. Four trips each way were put on, three being via Farnham Royal and the other via Stoke Pogis. Three other trips were made by another bus through Stoke to the "One Pin" Inn, near Hedgerley. This latter service, however, proved a failure and was discontinued after June 30, beyond Stoke. On July 1 the Beaconsfield trips were increased to six each way, with two others only so far as Farnham Common. These were both taken off before long and on August 10 the whole service was simplified by running half

the trips by Farnham and half by Stoke. These villages are little more than a mile apart, the roads being parallel and cross-connected. Since Nov. 7 the service has been reduced for the winter to four trips to Beaconsfield, two via Farnham and two via both Farnham and Stoke, with an evening trip to Farnham Common only. Since June 5 there have been two journeys on Sundays to Beaconsfield. The run takes 45 minutes either way, for which the fare is 1s. The omnibuses have only one compartment, seating 12 or 14 people, and two can sit beside the driver. Luggage and parcels are carried on the roof.

On July 18 a motor bus service was started between the Slough and Windsor stations, passing through Eton. This paralleled the company's own branch line, which, however, keeps about half a mile west of the high-road and has no intermediate station. Eton College owns the land it runs through and wishes to preserve it for the future needs of the school. Along the road population is almost continuous, and the bus service has proved very useful. It runs hourly in each direction, beginning from Slough at 9 a.m. till 9 p.m., and on Sundays from 2 p.m. till 9. Three pence (6 cents) is charged for the whole journey of about 2½ miles, or 2d. from either end to Eton. The vehicles carry 16 passengers inside, 18 on the top, and two in front, are 24 ft. long over all, 7 ft. 2 in. outside width, and are 12 ft. 6 in. high to the top rail, on a wheel-base of 11 ft. 3 in. The four-cylinder petrol engines are nominally 20 but really 25 h.p. Four speeds and a reverse are provided, the maximum rate being 12 miles an hour. Solid Shrewsbury-Challiner tires are on all the wheels, the drivers having double ones. Another service has been established very recently to link up disconnected branch termini not far apart by road but a long way by rail. These places are Calne and Marlborough, small Wiltshire towns 13 miles from each other by the route taken, but 33 by rail. Eight villages of some importance are passed through, and as the district is of extraordinary archæological interest a good deal of tourist traffic may be expected at the proper time. Three trips are made each way, on week-days only, the time taken being 85 minutes and the through fare 37 cents. The vehicle used is of the same kind as the Plymouth and Roborough one; it began running on October 10.

A second case of "linking-up" the railroad system is the bus service between Wolverhampton and Bridgnorth, commenced on Nov. 7. These towns are barely 15 miles apart by road, but quite twice as much by rail. The country between is hilly and very thinly populated and could not possibly maintain a railroad. Either of the present routes involves two changes of train and a deal of delay, which is obviated by the new busses. They do the run three times each way on week-days and twice on Sundays, in 90 minutes, the fare, station to station, being 2s. A separate service is run from Wolverhampton along the same road only to the village of Wightwick, hourly from 9 till 9, taking 25 minutes. This, of course, is to develop local traffic. On Sundays it is from 2 till 9. A "light railway" or tramway had been projected between Wolverhampton and Bridgnorth, which the Great Western successfully opposed, pledging themselves to provide improved accommodation all the same. The Severn Valley at Bridgnorth is highly picturesque, but very inaccessible from the east, where most of the population is.

A new development, at the time of writing, is the motor bus service from Wrexham, in Denbighshire, to Farndon, about seven miles. This place and Holt, virtually one, form a large agricultural center entirely away from railroad communication. Fruit growing has much increased and the neighborhood much needs traveling facilities. Since Nov. 21 there have been four trips each way, taking 40 minutes, at a fare of 6d., which it will be noticed is cheaper than the other fares. Two extra trips are made on Thursdays and Saturdays, but there is no Sunday service.

In all these services the busses take up anywhere, on payment of fare from the previous stages. Bicycles are always charged 1s. At first 6d. (12½ cents) was the rate, but they are such a nuisance in transit that the higher charge is perfectly justified. The company, after its experience on the Lizard route, now always add "condition of roads permitting" to the announcements of these services. Through railroad tickets are not issued on, or by the busses or motor cars. That they meet a public want is already evident and it is probable that the system will be largely developed before long; in fact, two or three other lines are already experimenting in a tentative way.

Railroad Shop Tools.

(Continued.)

SHAPING MACHINES.

The 16-in. crank shaper shown in Fig. 1 is made by the Queen City Machine Tool Company, Cincinnati, Ohio. This machine is designed for heavy work, and to insure durability, ample bearing surfaces are provided for the different parts. The ram has a bearing of 30¼ in. x 10 in. It is of arch construction and is designed to that the section gradually increases in strength, and is strongest at the point where the leverage is greatest, which is when the cutting tool is at its extreme position. The construction of the rocker arm is shown in Fig. 2. It is connected to the ram by a link, by means of which a direct pull and an even cutting speed is imparted to the ram. The wear of the crank shoe can be compensated for by means of the adjusting screw, shown in the illustration. The ram has four speed changes and the length of stroke and the position of the ram can be changed while the machine is in motion. The rail has a 9-in. front and a 1½-in. top bearing surface. It has a cross

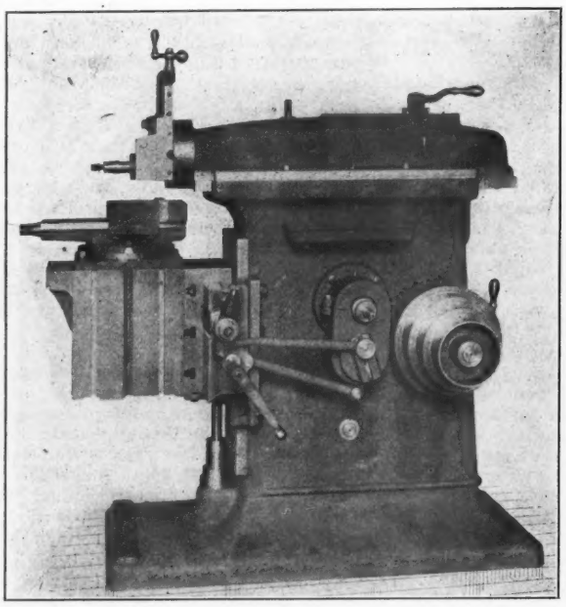


Fig. 1—The Queen City Shaper.

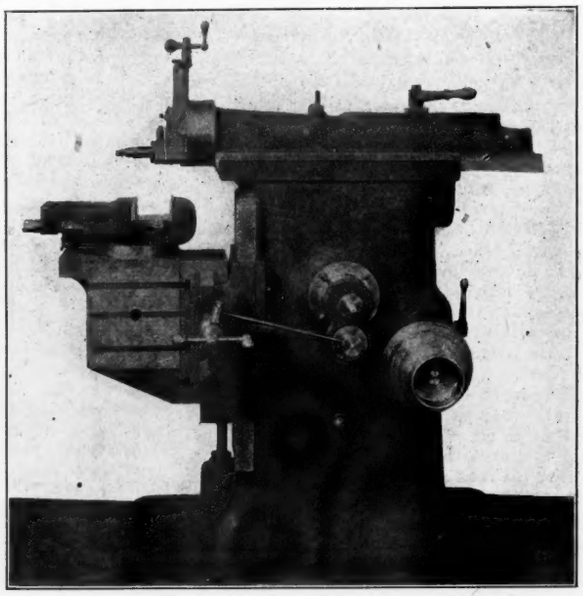


Fig. 3—The Springfield Shaper.

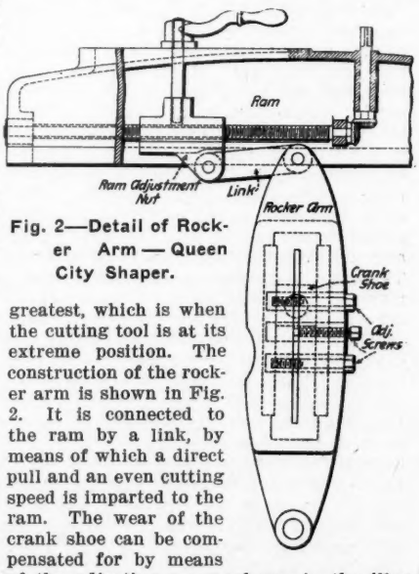


Fig. 2—Detail of Rocker Arm — Queen City Shaper.

traverse of 21 in. and the traverse screw has a graduated collar. Vertical adjustment of the rail is effected by means of a telescopic screw and bevel gears; the gears are protected from chips and dirt and are provided with ball bearings, which reduce the friction to the minimum. The table has T-slots on its top and sides, and it also has a V cut in its side for holding shafts and similar work vertically. It can be detached from the saddle, and an extension on the table provides a broad clamping surface. The base of the vise can be firmly bolted to the top or sides of the table, and the swivel is held to the base by two steel planer-head bolts. The head swivel is held in the same manner; both are graduated, and can be set to any angle. A down feed screw on the head is provided with a graduated collar and a large opening under the ram provides for the key-seating of shafts or similar work of any length. This machine is provided with a back gear ratio of 20 to 1, and the changes from one set of gearing to the other are made by a lever by means of which either one of two gears, which are keyed to a sleeve sliding on the driving shaft, may be thrown in or out of mesh with the gears on the back shaft. The cone pulleys have four steps, and the countershaft, which is fitted with tight and loose pulleys 12 in. in diameter, should run at 225 r.p.m. The net weight of this tool is about 2,450 lbs., and if it is to be electrically driven a 2½ h.p. motor is recommended.

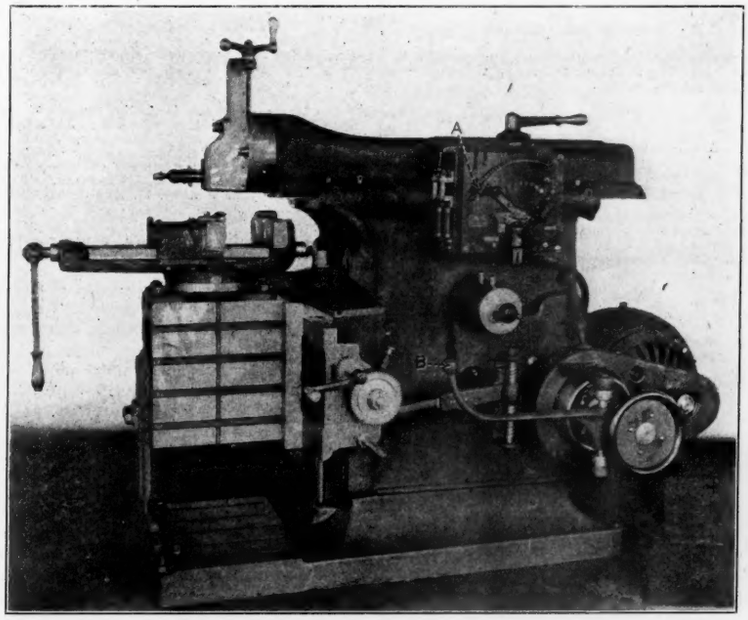


Fig. 4—The Gould & Eberhardt Shaper.

The accompanying illustration, Fig. 3, shows a 16-in. back-geared shaper made by the Springfield Machine Tool Company, Springfield, Ohio. The column of this machine is in one piece and contains bored seats for the journal boxes of the mechanism. The bearing surface for the ram is 26 in. long and extends beyond the column, as shown, and the surface to which the cross rail is clamped is long enough to allow of a vertical adjustment of 15 in. The ram is of semi-circular section and has a maximum stroke of 17 in., and its stroke can be adjusted to suit the work while the machine is in motion. The tool head has a graduated swivel, adjustable to any angle, and it is secured to the ram by two bolts. The down feed screw has an adjustment of 6 in. It has a micrometer collar and can be furnished with an automatic feed, if desired. A ball-bearing thrust is provided for the elevating screw of the cross rail. The cross motion of the table is 20 in. and the cross feed screw has a power feed in either direction and is fitted with a micrometer collar. Adjustable gibs are provided on the cross rail for taking up lost motion. Two studs and one bolt secure the box table to the cross slide. The top of the table is 13 in. x 11¼ in. and it has T-slots on three of its sides. Steel-faced jaws are provided for the vise, which has a graduated circular base. An index pin is also provided, which locks the vise when it is set parallel or at right angles to the ram. An opening large enough to pass a 2¼-in. shaft through is provided under the ram. The driving mechanism is arranged for two speeds which, in connection with the four-step cone, gives eight speeds in geometrical progression. The driving shafts are journalled in ring oiling bearings, and fitted with gears which are controlled by a lever at the rear of the column. Both sets of gears cannot be engaged at the same time, hence breakage from such cause is avoided. The stroke of the ram is varied by means of a heavy wrist block, which is adjustable in large guides planed into the crank gear. Quick return motion is given to the ram and the motion of the cutting stroke is nearly uniform. The driving cone has four steps measuring 10 in., 8½ in., 7 in. and 5½ in. respectively; the countershaft pulleys are 10 in. in diameter and 3 in. wide, and should run at 200 r.p.m. The floor space required for this tool is 38 in. x 80 in., and its net weight is 2,200 lbs.

Fig. 4 shows a direct-connected, motor-driven shaper made by Gould & Eberhardt, Newark, N. J. The motor is of the variable speed type, single voltage, and the speed variations are obtained by changing the field resistance. A combination starting box and field rheostat with the switch and fuses mounted on the side is attached to the machine, as shown. With this drive it is possible to get a series of speeds ranging from five strokes per minute, back-geared, to about 110 strokes per minute, single-geared. The speed changes are obtained by moving the small slider A along the curved rail, which brings it in contact with the different buttons in the field rheostat. The connection between the motor and the machine is by a Morse silent chain drive. The machine is also supplied with a convenient clutch and brake arrangement designed by Gould & Eberhardt. This device is controlled by the long curved lever B, by one movement of which it is possible to instantly stop the shaper at any part of its stroke, without cutting out the motor, and waiting for it to run down; by a reverse movement of the lever the machine is again started up at full load. This device is not only a time saver, but is also convenient in setting, adjusting and when examining the work, and in addition to the above it saves the wear and tear on the motor which would occur with frequent stoppages. All the controlling handles are placed within convenient reach of the operator while standing in the working position at the machine. The illustration shows a 24-in. extension base shaper with an outside support to the table. A number of machines of this pattern are being used in railroad shops both in this country and in Europe.

(To be continued.)

Program of the International Railway Congress.

The International Railway Congress which meets in Washington next May will hold its first session on the morning of Thursday, May 4. Delegates are expected to arrive during the four days from April 29 to May 2 and on Wednesday, May 3, the registration bureau for the delegates will be opened. After the formal opening of the Congress in the morning, the various sections will meet and organize on Thursday afternoon. The different sections will hold meetings at 9:30 a.m. and 2 p.m. on Friday and Saturday of that week and on each of the first five days of the following week. On Saturday, May 13, the sections will meet in the morning, and in the afternoon the Congress will meet together and formally adjourn. The delegates and visitors will leave on Monday for tours of inspection through the country.

The following is a list of subjects which will be considered by each of the sections and the reporters for different countries who will present papers:

SECTION 1.—WAY AND WORKS.

I.—Wooden Sleepers or Crossties. Selection of Species of Timber Used and Processes of Preservation.

A.—Study of the selection of kinds of wood and of the processes of preservation of railway sleepers or ties.

Reporters:

America.—Mr. J. W. Kendrick, Third Vice-President, Atchison, Topeka & Santa Fee Railway, Chicago, Ill.

Other Countries.—Mr. Hausser, Chief Engineer of Maintenance of Way of the Southern Railway of France, 54 Boulevard, Haussmann, Paris.

B.—Study of the causes of the deterioration of wooden sleepers or crossties in tropical climates and of the methods for preventing such deterioration.

Reporters:

All Countries.—Mr. F. J. E. Spring, Director of Railway Construction in India, Office of the Secretary of Public Works, Calcutta.

II.—Rails for Lines With Fast Trains.

Cross-sections of heavier rails; manufacture and inspection; best metal to use for rails and tires; nickel alloys; rail joints; improvements in suspended joints; experiments with supported joints; experiments with a view to reducing the number of joints; methods for preventing creeping, especially on double-track lines and on steep gradients.

Reporters:

America.—Dr. P. H. Dudley, Inspecting Engineer New York Central & Hudson River Railroad, New York City.

Germany, Netherlands, Roumania, Russia, Denmark, Sweden, Norway and Switzerland.—Mr. J. W. Post, Principal Engineer of Way and Works to the company for working the Netherlands State Railways, Utrecht.

Other Countries.—Mr. Van Bogaert, Chief Engineer to the Belgium State Railways (on leave), Director of the Society for the Survey of Railways in China, Montagne du Parc, 2a, Brussels.

III.—Improved Rail Crossings (Frogs).

Improvements in rail crossings; spring frogs, movable point frogs and crossings and continuous rail-crossings in which the gas at the throat of the

frog is done away with, which shall satisfy all the requirements of modern traffic and stand heavy locomotives being run over it at high speed without any shock.

Reporter:

All Countries.—Mr. C. W. Buchholz, Consulting Engineer Erie Railroad, 21 Cortlandt St., New York City.

IV.—Concrete and Imbedded Metal.

The use of concrete strengthened by the use of imbedded metal in railway works.

Comparison, from the point of view of cost, of bridges of concrete, strengthened by the use of imbedded metal, with those of metal.

Reporters:

America.—Mr. J. F. Wallace, Chief Engineer Panama Canal Commission, Evening Star Building, Washington, D. C.

Russia.—Mr. Serge Kareischa, Councillor of State, Professor of the School of Ways of Communication, Assistant Inspector of Imperial Trains, and President of the Bureau of Consulting Engineers of Maintenance of Way, Jagorodny Pros., No. 70, Log 4, St. Petersburg.

Other Countries.—Mr. W. Ast, Royal Councillor, Civil Engineer of the Nord Empereur Ferdinand Railroad of Austria, 50 Nordbahn Strasse, Vienna.

SECTION 2.—LOCOMOTIVES AND ROLLING STOCK.

V.—Locomotives of Great Power.

Increase in the power of locomotives by the adoption of high pressures and of the compound principle. Improvements in construction from this point of view. Use of nickel steel.

Reporters:

America.—Mr. J. E. Muhlfeld, General Superintendent Motive Power, Baltimore & Ohio Railroad, Baltimore, Md.

Other Countries.—Mr. Edouard Sauvage, Chief Consulting Engineer of the Western Railway of France, 14 Rue Eugene Flachat, Paris.

VI.—Pooling Locomotives.

The use of two or more crews. Advantages and disadvantages of the practice and the result of such common use with respect to the efficiency and the care of the locomotive.

Reporters:

United States.—Mr. G. W. Rhodes, General Superintendent Wyoming District, Lines West of Missouri River, Chicago, Burlington & Quincy Railway, Alliance, Neb.

Belgium, United Kingdom and Colonies, Netherlands, Denmark, Sweden, Norway and Russia.—Mr. Hubert, Director of the Belgian State Railways, 13 Rue de Louvain, Brussels.

Other Countries.—Mr. Boell, Chief Engineer of Mines, Chief Engineer of Rolling Stock and Motive Power of the State Railways of France, 136 Boulevard Raspail, Paris.

VII.—Automatic Couplers.

Advantages and disadvantages of automatic couplers. Improvements effected in their construction. Their use in conjunction with other couplings.

Reporters:

America.—Mr. A. W. Gibbs, General Superintendent of Motive Power, Pennsylvania Railroad, Altoona, Pa.

England.—Mr. W. F. Pettigrew, Locomotive, Carriage and Wagon Superintendent Furness Railway, Barrow-in-Furness.

Other Countries.—Mr. G. Noltein, Director of the Moscow-Kazan Railway, Moscow.

VIII.—Electric Traction.

Progress made in electric traction on important lines of railways. Continuous current, alternating current, polyphase current, Experiments made with high tension currents.

Reporters:

America.—Mr. W. D. Young, Electrical Engineer, Baltimore & Ohio Railroad, Baltimore, Md.

France.—Mr. Paul Dubois, Engineer of Bridges and Highways, Engineer of the Central Service Motive Power of the Orleans Railway, Boulevard de la Gare, 41, Paris.

Great Britain and Belgium.—Mr. Ernest Gerard, General Inspector, Chief of the Cabinet of the Belgium Minister of Railways, 25 Avenue des Arts, Brussels.

Other Countries.—Mr. Victor Tremontani, Engineer, Chief Inspector of the Electrical Section of the Mediterranean Railway of Italy, Milan.

SECTION 3.—WORKING.

IX.—Lighting, Heating and Ventilation of Train.

(Sections 2 and 3 Conjointly.)

Improvements made in the lighting, heating and the ventilation of trains.

Reporters:

America.—Dr. C. B. Dudley, Chemist Pennsylvania Railroad, Altoona, Pa.

Other Countries.—Mr. Cajetan Banovits, Ministerial Councillor, Superintendent of Rolling Stock and Motive Power of the Hungarian State Railways, Budapest.

X.—Automatic Block System.

What are the recent improvements in automatic block-signaling apparatus, and what progress has been made in their introduction?

Reporters:

America.—Mr. C. H. Platt, ex-General Superintendent Western District New York, New Haven & Hartford R. R., Room 1410, 20 Broad St., New York City.

Other Countries.—Mr. Margot, Engineer, Assistant to the management of the Paris, Lyons & Mediterranean Railway Company, 88 Rue Saint Lazare, Paris.

XI.—Baggage and Express Parcels.

(*a*) Baggage—Handling and protection of baggage. Methods of avoiding detentions, losses and diversions in transporting.

Reporter:

All Countries.—Mr. Geo. H. Daniels, General Passenger Agent New York Central & Hudson River Railroad, New York City.

(*b*) Express Parcels—Handling and protection of express parcels for quick or slow delivery. Methods for avoiding detentions, losses and diversions in transporting.

Reporter:

All Countries.—Mr. J. H. Bradley, General Traffic Manager American Express Company, 65 Broadway, New York City.

XII.—Suburban Traffic.

Arrangements for suburban passenger traffic.

Reporters:

America.—Mr. A. W. Sullivan, General Manager Missouri Pacific Railway, St. Louis, Mo.

Other Countries.—Mr. H. G. Drury, Superintendent of the Line Great Eastern Railway, Liverpool Street Station, London, E. C.

SECTION 4.—GENERAL.

XIII.—Slow Freight Rates.

General principles and description of the different systems of rating slow freight goods.

Reporters:

America.—Mr. M. C. Markham, ex-Assistant Traffic Manager Illinois Central R. R., 4956 Madison Ave., Chicago, Ill.

England.—Mr. Smart, Secretary Railway Clearing House, Seymour St., Euston Square, London, N. W.

Italy, Spain, Portugal, France and Belgium.—Mr. Mange, Engineer, Assistant General Superintendent of the Paris & Orleans Railway Company, Place Valhubert, 1, Paris.

Other Countries.—Mr. W. J. Van Overbeek de Meyer, Chief of the Division of Tariffs of the Company operating the Holland State Railways, Utrecht.

XIV.—Bookkeeping.

Bookkeeping generally: Description of the different existing systems; comparison from the double point of view of efficiency and economy. The question of adopting one uniform system on the different railways.

Reporters:

America.—Mr. A. H. Plant, Comptroller Southern Railway, Washington, D. C.

Russia.—Mr. Jean de Richter, Assistant Chief of the Line St. Petersburg-Warsaw of the Empire Railways of Russia, Gare de Varsovie, St. Petersburg.

Other Countries.—Chevalier von Lohr, Engineer, Royal Councillor, Auditor of the Nord Empereur Ferdinand Railroad of Austria, III. 2, Gartnergasse, 18, Vienna.

XV.—Duration and Regulation of Work.

Length of time on duty and working regulations for railroad employees and laborers.

Reporters:

America.—Mr. G. L. Potter, Third Vice-President, Baltimore & Ohio Railroad, Baltimore, Md.

Switzerland.—Mr. Placide Weissenbach, President of the Swiss Federal Railways, Berne.

Other Countries.—Mr. Philippe, General Inspector of the North Belgium Lines, Member of the International Commission of the Congress, Liege.

XVI.—Provident Institutions.

General principles of plans for the retirement and insurance railroad employees and workmen.

Reporters:

Countries using the English Language.—Mr. M. Riebenack, Assistant Comptroller Pennsylvania Railroad, Philadelphia, Pa.

Other Countries.—Mr. Lemercier, Doctors of Laws, Secretary of the Eastern Railway Company of France, 21 Rue d'Alsace, Paris.

SECTION 5.—LIGHT RAILWAYS.

XVII.—Influence of Light Railways on the Main Line.

Influence which the construction of light railways may have on the traffic of the main lines.

Co-operation of the main lines in the construction and working of light railways.

Reporter:

All Countries.—Mr. de Burlet, General Manager of the National Light Railways of Belgium, Member of the International Commission of Congress, 14 rue de la Science, Brussels.

XVIII.—Direct Financial Co-operation by Public Authorities.

Financial co-operation by the State (general government) and by localities interested (counties, districts, parishes, etc.), in the development of light railways.

Results obtained in Belgium by the institution of a central authority for studying the projects, supervising the construction and organizing the working of secondary railways, constructed with the financial assistance of the State and of the districts affected.

Reporters:

France, Belgium, England and Germany.—Mr. Colson, Councillor of State, Chief Engineer of Bridges and Roads, Member of the International Commission of the Congress, 139 Boulevard Saint-Germain, Paris.

Other Countries.—Mr. F. A. Ziffer, Civil Engineer, President of the Lemberg-Czernowitz-Jassy Railway, I. Operming 5, Vienna.

XIX.—Organization of a Cheap Service on a Main Railway's Branch Lines which carry Little Traffic and on Light Railways. (Sections 3 and 5 conjointly.)

Simplifications in the conveyance of passengers, parcels (express packages), and goods. Special motors and rolling stock.

Reporters:

All Countries, except America, Austria-Hungary, Germany and Holland.—Mr. Joseph Rocca, Engineer, Chief Inspector of the General Direction of the Mediterranean Railway of Italy, Milan.

Austria-Hungary, Germany and Holland.—Mr. Cornel Tolnay, Principal Inspector and General Superintendent of the Hungarian State Railways, Debreczen.

XX.—Traffic Conveyed by Automobiles. (Sections 4 and 5 conjointly.)

Organization of services by automotors on routes where there is not enough traffic for a railway.

Reporters:

All Countries.—Messrs. Lechelle, Superintendent of Transportation of the Northern Railway of France; Eugene Sartiaux, Engineer, Electrical Superintendent of the Northern Railway of France, and Keromnes, Principal Engineer of the Machine Shops of La Chapelle and Hellemmes, of the Northern Railway of France, 95 Rue de Maubeuge, Paris.

METHOD OF CONDUCTING THE WORK OF THE SECTIONS.

In conformity with Article 14 of the rules, each section names its president, its principal secretary and its assistant secretaries. As it is important that the offices of president and principal secretaries should be equitably divided among the different nationalities represented at the Congress, and in order that the candidates may prepare themselves to fulfill their duties, the International Commission selects the candidates in advance and submits their names for ratification by the sections.

The president of each section nominates, subject to the approval of the assembled section, such other secretaries as he may desire to have associated with him as collaborators.

The International Commission will also designate, if the case requires it, one or more secretary reporters for each section, to serve as interpreters for the members who do not speak the French language.

In conformity with Article 16 of the rules, "the discussions take place in French or in the language of the country in which the Congress is held." The interpreters will translate into French, remarks spoken in any other language. In order to carry out this article of the rules, the members of the sections, and in case of necessity, the secretary reporters, will kindly lend their aid to the president or to the principal secretary of each section.

At the beginning of the session of the section, the president of each section will determine, in accordance with the wishes of the assembly, the arrangement of the days for the meetings, in order to fix, as exactly as it is possible to do it, the day upon which each of the questions submitted to the section alone, or discussed with other sections, will be handled.

The Prussian State Railroads recruit their enginemen from their shop hands, and the rules require that only those be admitted as firemen who have the school education required for enginemen, to which position they may be promoted in course of time. The authorities have found that very many of these aspirants for the locomotive service lack the required schooling, and have recently given orders that hereafter when this is the case with otherwise capable shop hands, the defects in their education be remedied by instruction furnished gratuitously by the shop and locomotive officials while theyare shop employees.

GENERAL NEWS SECTION

THE SCRAP HEAP.

The surgeons of the Atlantic Coast Line have formed a society, and the President is Dr. Southgate Leigh, of Norfolk, Va.

The Industrial Commissioner of the Chicago, Milwaukee & St. Paul, Mr. W. B. Davenport, having resigned, the company has decided to abandon the industrial department.

The latest proposition for a railroad men's organization is that the Boss Grievers get together. Mr. Meenan, of the Brotherhood of Railroad Trainmen, proposes the formation of the Eastern Association of General Grievance Committee Chairmen.

Gambling, housekeeping and theology are taught by mail, and now we have an offer to teach railroading in that way. The Wentne Correspondence School, at Freeport, Ill., makes this offer. A number of men connected with the Freeport division of the Illinois Central are said to be the chief officers of the establishment.

Proceedings have been instituted at Springfield, Ill., by the United States district attorney to collect penalties from a number of roads for failure to obey the law in regard to the use of safety appliances. Among these lines are the Big Four, the Baltimore & Ohio Southwestern, the Alton, the Louisville & Nashville, the Southern, the Wabash, the Illinois Central and the Terminal Railroad Association of St. Louis.

The assignment of crews exclusively to fast freight trains which has been in force experimentally on the Middle Division of the Pennsylvania Railroad for several months, has proved so satisfactory that 15 more crews have now been thus assigned. Eight of these crews will have their headquarters at Harrisburg and seven at Altoona. These trains are run with engines of the F-3 B type.

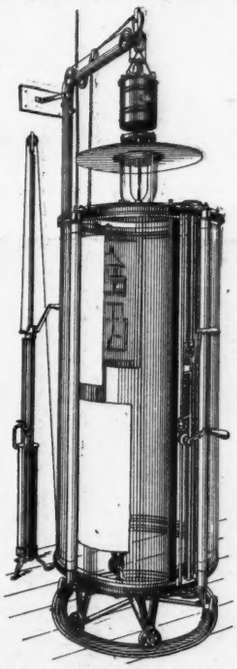
Between Chicago and suburban stations, within 22 miles, the Chicago, Burlington & Quincy has reduced the prices of single trip tickets to a basis a little above that charged for family coupon tickets, with a view to putting a stop to speculation in the latter form of tickets. Many druggists, and other merchants, have made a regular business of lending citizens book tickets for use for single trips, dividing the saving with the passenger. The officers of the railroad have concluded that the concessions to the passenger had better be made by the railroad company directly. It is hoped that this will stimulate the traffic sufficiently to avoid a loss in net income.

Ore Shipments on the Great Lakes in 1904.

The total ore shipments for the season of 1904 were 21,226,591 tons as against 23,649,550 tons for the season of 1903, a decrease of 2,422,959 tons. The opening of navigation this year did not begin until June 15. A good stock pile was left on dock May 1, and as furnace consumption was light at the time there seemed to be little future demand for ore. On July 1 the movement of ore was 1,771,726 tons compared with 8,237,927 tons for the same period during 1903. However, trade conditions rapidly improved with consequent demand for ore, and the movement during the months of August, September, October and November were the heaviest ever known in lake trade. It was handled with consummate ease by the existing fleet and the railroads were also able to give good service so that delays at receiving ports were not serious. As an instance of heavy shipments, 3,569,432 tons were shipped after Nov. 1 this year as against 1,266,200 tons after Nov. 1 last year, an increase of 2,303,232 tons. The mere increase of November shipments this year over the shipments of November last year are actually greater than the total movement of ore during the entire season on the great lakes 20 years ago. The ore movement of 1905, it is believed, will be very heavy.—*Marine Review.*

The Keystone Blue Printing Machine.

The accompanying illustration shows the Keystone blue printing machine made by the Keystone Blue Paper Company, Philadelphia, Pa. The machine occupies a floor space of about 4 sq. ft. The body of the machine consists of two halves of a glass cylinder 30 in. in diameter, mounted in a metal frame which revolves on a circular track. The tracings and paper are held in contact with the two halves of this cylinder by means of a quick-acting, spring-actuated roller curtain device, which winds and unwinds a curtain upon the outer surface of the glass cylinder. By means of a crank attachment which is provided with automatic stops the curtain can be held in contact at any point on the surface of the cylinder, thus allowing small tracings to be readily placed in position. A specially designed arc lamp, provided with two patent light-controlling screens is used for printing. The light is raised and lowered within the glass cylinder by means of an hydraulic lowering device, which can be regulated to work at varying speeds by turning a valve. These machines are made in five sizes and it is claimed that a 42-in. x 60-in. machine will make two prints 42 in. x 62 in. in about two minutes. The Keystone Blue Paper Company was awarded a gold medal for this machine at the St. Louis Exposition.



The Keystone Blue Printing Machine.

Fires.

Reports from Fort Worth, Tex., state that the union passenger station at that place was damaged by fire December 17, loss about $250,000. The annex of the Bradley car shops at Worcester, Mass., was destroyed by fire December 19 with a loss of about $10,000. The large coal trestles of the Buffalo Creek Railroad in the southern part of Buffalo, N. Y., were destroyed by fire December 14. The Adams Express Co. suffered a loss of a large amount of currency (said to be $240,000) by the burning of an express car at Webster Junction, Mass., on the Boston & Albany, December 16. The money was in an iron box. The fire is said to have been started by the explosion of a lamp.

New Naval Ships.

Bids were opened at the Navy Department last week for the construction of the battleship New Hampshire and the armored cruisers North Carolina and Montana, the battleship to be of 16,000 tons displacement and the cruisers of 14,500 tons each. Eight bids were submitted, which varied considerably as to date of delivery, as well as in cost. The Naval Board on Construction has recommended that the award of contract for the two cruisers be made to the Newport News Shipbuilding & Dry Dock Co., at its bid of $3,575,000 for each vessel, and the contract for the battleship be let to the New York Shipbuilding Co., at its bid of $3,748,000, and Secretary Morton has approved these recommendations. These bids were the lowest submitted and aggregate $1,377,000 less than the aggregate lowest bids received for three similar ships about a year ago, being a reduction of 11 per cent. in price.

Record Run of the Westinghouse World's Fair Turbine.

A memorable incident of the morning following the close of the St. Louis Exposition was the formal shut-down and inspection of the 600 h.p. Westinghouse steam turbine generating unit in the Palace of Machinery after a continuous run of over 3,962 hours—a performance which is claimed to have no parallel in steam turbine history. This machine was started on its long run at 9:20 o'clock on the morning of Monday, June 20, shortly after its installation at the fair, and was stopped at 11:32 o'clock on the morning of Friday, December 2. During the five and a half months that the unit was in operation it supplied current for light and power throughout the Westinghouse exhibits in the Palaces of Machinery, Electricity and Transportation. Charles F. Foster, chief operating engineer of the Exposition; H. M. Holman, supervising engineer at the Government Exposition gas engines tests, formerly President of the St. Louis Board of Public Works, and a number of Westinghouse representatives, including Wallace Franklin, of Detroit; C. C. Chappelle, of Chicago, and W. K. Dunlap, managing director of the Westinghouse exhibits, were present when the engine was stopped. It was found to be in perfect condition, and there were no signs of wear, the bearings still retaining the tool marks as they had come from the shops.

There have been at least two instances on record in America in which piston engines have been run continuously for about the same length of time as that of the record run of the Westinghouse turbine. The remarkable feature of the turbine run, of course, was the maintenance under load of a speed of 3,600 revolutions a minute for such a long period. From 8:30 o'clock in the morning to 10:30 o'clock in the evening, the load carried throughout the Exposition varied from 25 per cent. underload to 25 per cent. overload. The total number of revolutions almost touched the billion mark—855,792,000.

Private Cars for the Rhodesian Railways.

The accompanying illustrations show the floor and interior and exterior views of a luxurious private car which has recently been built by the Electric Railway and Tramway Carriage Works, Lim., Preston, Lancashire, England, for Sir W. H. Milton, Administrator of Rhodesia. The car was designed by Sir Douglas Fox & Partners and Sir Charles Metcalfe, consulting engineers for the Rhodesian Railway. It is 54 ft. 4 in. long over platforms and is divided into six compartments opening off of a corridor running along one side of the car. An open observation platform is built at one end and a narrow platform with refrigerator and coal box takes up the other end. A slat seat with locker underneath is built against the end of the car on the observation platform and storm curtains are provided to completely enclose the platform.

Exterior of Private Car for the Administrator of Rhodesia, Rhodesia Railways.

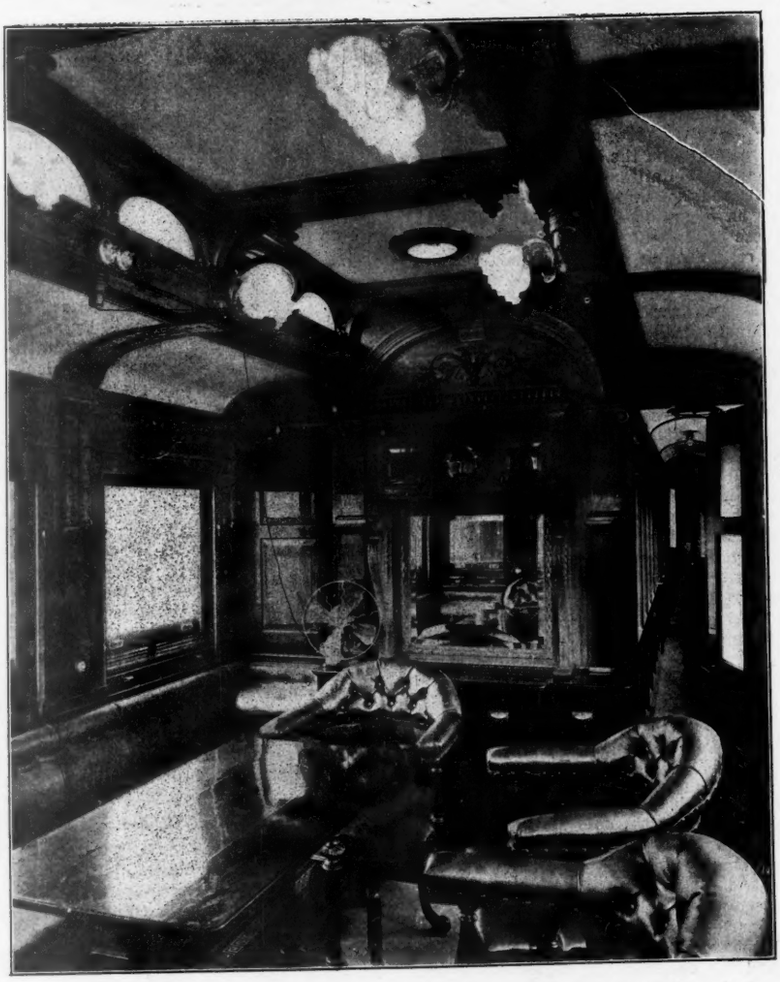
The living room, which is the whole width of the car and 11 ft. $1^{7}/_{16}$ in. long, is elaborately finished. The walls below the belt rail are of Spanish mahogany and above the belt rail carved white mahogany has been used. The ceiling is cream colored enamelled millboard, and the furniture is all upholstered in red morocco leather. Besides the couch and revolving arm chairs there is a flap table in the center of the room and a handsome carved sideboard built into the partition at one end. The floor is covered with thick linoleum and a loose rug.

The stateroom is finished in the same decoration as the living room. The couch can be made up into an upper and a lower berth by raising the hinged back. Dark blue morocco has been used in the upholstery of the furniture in this room. A writing desk, folding wash basin and wardrobe with full length mirror are also built into the walls.

The secretary's room or office is of simpler design and finish than the other two rooms. It is finished in light and dark oak and the couch berth is upholstered in rattan, as is the revolving desk chair. A large desk with disappearing typewriter top is provided. The lavatory is enamelled white throughout, the sides being lined with zinc. The floor is sheet lead with teak grating, and in addition to the water closet, wash stand and Pasteur filter, a needle shower bath has been put in. This feature is a luxury greatly appreciated in South Africa.

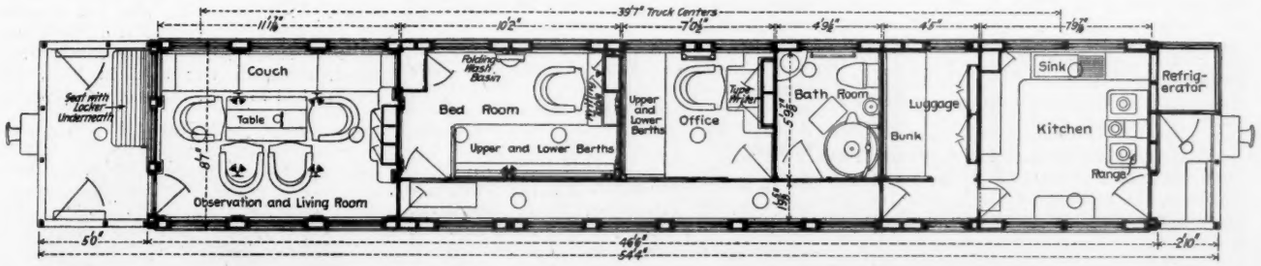
The luggage compartment, which may also be used as a servants' bedroom, has two berths similar to those in the secretary's room. A narrow door swinging out is placed in each side of the car in this compartment so as to handle the luggage in and out without carrying it through the corridor. The kitchen is enameled white and has, besides the double coal range with ovens, water boiler, etc., two serving tables, a copper lined sink with hot and cold water taps, dish racks, refrigerator and all the other furnishings of a complete kitchen.

The body framing and exterior finish of the car is teak varnished in the natural color. Each window opening has three independent sashes, two of glass and one filled



Interior of Living Compartment of Private Car, Rhodesia Railways.

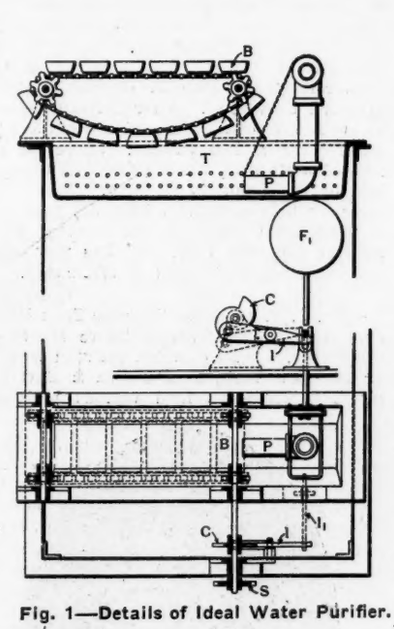
with dust-proof wire gauze netting. The underframe is made of steel channels. Electric lights and fans are provided in each compartment. A water tank hung under the car and holding 96 gallons is connected with a hand pump to the feed tanks on the roof, and a total of 294 gallons can be carried. The car is mounted on two four-wheel trucks of 3 ft. 6 in. gage, and is equipped with vacuum brakes with a controlling valve on the observation platform.



Floor Plan of Private Car for the Administrator of Rhodesia, Rhodesia Railways.

The Ideal Water Purifier.

The accompanying illustrations show the general arrangement and details of a water purifying apparatus designed by the Ideal Water Purifying Company, 114 Liberty street, New York. The apparatus consists, essentially, of two sheet iron tanks, each of which holds enough water to supply the boilers for at least two hours. The tanks are arranged to operate alternately. That is, while one is filling up, the other is being drawn from by the boiler feed pump. The chemicals are introduced at the top of each tank (see Fig. 1), each small bucket, (B), holding the required amount for one tank of water. The chemicals fall into the trough (T) and mix with the incoming raw water from the pipe, (P). The treated water overflows into the tank through the perforations in the trough. When the tank is filled the float (F_1) closes the water supply valve (V). The treated water is then drawn off through the pipe (p), the intake of which is always held several inches beneath the surface of the water (see Fig. 2) by the float (F_2). The water passes through a filter on its way from the tank to the feed water pump. While the tank is being emptied, the float (F_1) is held in its upper or closed position so that no raw water enters the tank during the process of emptying. When the tank is nearly empty, it is only necessary for the boiler room attendant to open the outlet valve from the other tank and close the outlet valve of the empty tank. The empty tank is then started to fill up again by turning a crank, operating the sprocket wheel (S), through 180 degrees. A cam (C) is on the same shaft with the sprocket wheel (S) so that when the shaft is turned the lever (l) is pushed down to the position as shown by the dotted lines. The lever (l) in turn operates the lever (l_1) which releases the float (F_1) and allows it to drop to its lower position and open the supply pipe valve (V). The turning of the sprocket (S) also dumps one of the buckets containing the chemicals so that a known and predetermined quantity of chemicals is supplied to each tank of water. These buckets are fastened to a chain which passes around two sprocket wheels, as shown. All the buckets on the upper side of the chain are filled once a day, enough buckets being provided to run the apparatus that length of time.



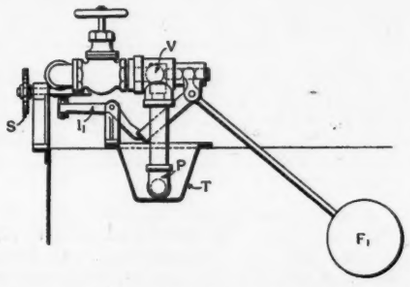


Fig. 1—Details of Ideal Water Purifier.

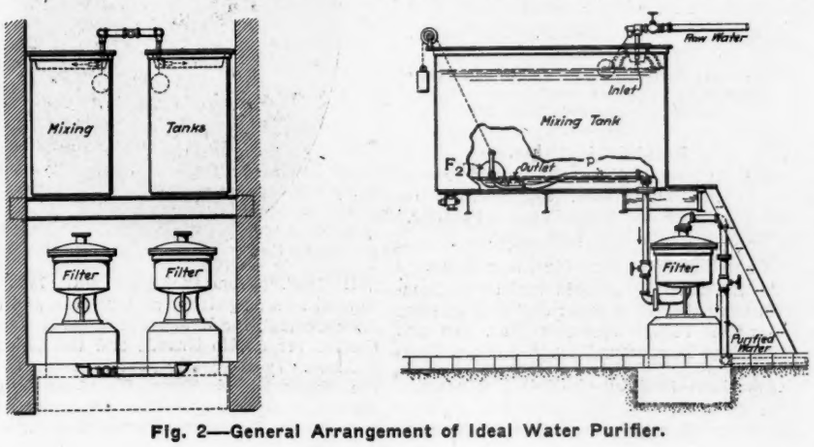


Fig. 2—General Arrangement of Ideal Water Purifier.

An Inside-Connected Locomotive for Purdue University.

Negotiations have been completed whereby Purdue University is to receive from the New York, New Haven & Hartford, through the courtesy of Mr. Samuel Higgins, General Manager, the historic locomotive, "Daniel Nason." A few years ago the university interested itself in securing from railroads samples of such classes of locomotives as are now being superseded by machines of more modern construction, its purpose being to preserve as museum exhibits, types of design which were in danger of becoming extinct. As a result of this plan, a number of valuable relics are already upon its grounds. From the beginning of this movement, an effort has been made to secure a representative of a type which was common throughout New England 30 years ago, namely, an eight-wheeled engine having cylinders inside the frame connecting with the crank axle. This effort has now been crowned with success. The "Daniel Nason" is said to have been built in 1858. It was exhibited in Chicago in 1893 and has since been held as a relic at Roxbury, Mass. The engine weighs about 25 tons, is complete with tender and will be shipped to the university at Lafayette, Ind., upon its own wheels. The university is also to become the custodian, in behalf of the same road of a stage-coach passenger car, which is said to have been placed in service in 1833. It consists of the body of a stage-coach suspended over a simple railroad truck by means of braces. It will seat inside and on its top about 20 persons.

Rensselaer Polytechnic.

The repairs to the chemical laboratory at the Rensselaer Polytechnic Institute, Troy, which was damaged by fire, have been completed and an addition to the electrical laboratory is now being made. A new main building is also to be built at a cost of $125,000. The new building will be used for recitation and lecture rooms only, and will be entirely fireproof. The sum of $100,000 was received in October for the endowment of the Chair of Geodesy and Railroad Engineering, and the salaries of the heads of the departments of Chemistry, Stereotomy, Pure Mathematics and Electrical Engineering have been increased. The number of students

now at the institute is the greatest in the history of the school.

Manufacturing and Business.

The Chicago General Construction Co., of Wilmington, has been incorporated in Delaware with a capital of $100,000 to build bridges, etc.

The Butler Reversible Steam Turbine Co., of Portland, has been incorporated in Maine with a capital of $3,000,000. N. W. Baldwin is President, and G. C. Knight, Treasurer, both of Portland.

The American Locomotive Company has presented to Purdue University, Lafayette, Indiana, the full-sized model locomotive cylinders sectioned to show the piston valve construction, which formed a part of its exhibit at the Louisiana Purchase Exposition, St. Louis.

The Appliance Manufacturing Co. has been incorporated in New York with a capital of $1,000,000 to make machinery by W. G. Hague, of New York, and C. T. Balcon and R. G. Johnson, of Brooklyn.

The Beall Non-Pounding Frog & Crossing Co., which has a capital of $500,000, is considering the building of shops early next spring at South Bend, Ind. The company will make railroad supplies and the Beall crossing frog.

Bids are wanted December 31 by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for building a concrete and granite dry dock at the New York navy yard. Mordecai I. Endicott is Chief of the Bureau.

The Northern Electrical Mfg. Co., Madison, Wis., recently received an order for three 150 k.w., slow speed generators from the Tennessee Coal, Iron & Railroad Co., of Birmingham, Ala. The order was received through J. B. McClary & Co., representing the Northern Electrical Mfg. Co., at Birmingham.

John F. Allen, New York, maker of the Allen portable pneumatic riveting machines reports the following recent sales: Fenwick Freres & Co., Paris, France; John Turbull, Jr., & Sons, Glasgow, Scotland; Cambria Steel Co., Johnstown, Pa.; Middletown Car Works, Middletown, Pa.; B. & O. R. R. Co., Baltimore, Md.

A reference book which will be appreciated by all those who are interested in biographical work is a directory of well-known engineers which is now being compiled by Ernest C. Brown, 280 Broadway, New York. There has long been a need for a record of the names and a brief outline of the careers of the many notable engineers in America.

J. A. Fay & Egan Co., of Cincinnati, Ohio, maker of wood working machinery, announces the opening of its new offices in Chicago, in the Railway Exchange Building, suite No. 751. The offices will be in charge of Mr. Everett S. Kiger. J. A. Fay & Egan Co. will do all business in this territory direct, discontinuing Manning, Maxwell & Moore, of Chicago, as its agents.

The California Gas & Electric Corporation, San Francisco, Cal., has just placed an order with Crocker-Wheeler Company, Ampere, N. J., for three 4,000 k.w. capacity, three-phase, 13,200 volt, 25 cycle, 88 r.p.m., revolving field alternating current generators to be driven by 5,400 h.p. gas engines built by the Snow Pump Co. It is claimed that these generators are the largest in capacity in the world driven by gas engines. They will furnish power for operating all the street railroads in San Francisco and vicinity.

Street's Western Stable Car Line has largely increased the facilities of its works at Chicago and announces its readiness to undertake the building of freight cars and the making of heavy repairs for outside interests. This company now owns and operates nearly 10,000 stock cars with which it supplies temporary additional needs of railroads, and this new feature is undertaken in the belief that it will work in harmony with the business already so well established. The Street's Line is practically the only large private car company that does not operate in connection with some industrial undertaking.

The new factory building of the Hope Webbing Co. at Pawtucket, R. I., measuring about 85 by 325 ft., presents an interesting application of the fan system of heating and ventilation. In connection with an old building, and contemplated additions, the total cubic contents amounts to about 875,000 cu. ft. In this installation, made by the B. F. Sturtevant Co., of Boston, Mass., the distributing ducts occupy no valuable space, for the heated air is forced through an underground system into vertical flues which are built into the brick walls. From these flues the air is admitted in the usual manner through openings placed about 8 ft. above floor level. With this arrangement it is possible to concentrate all of the heating surface in a single fireproof casing in connection with the fan, and to eliminate from the entire building all extended systems of steam piping.

Iron and Steel.

Reports from Pittsburg state that a large contract calling for 12,000 tons of structural steel for the Boston Elevated Railroad, which will require 18 months for production, has been given to the Fort Pitt Bridge Co., of Pittsburg.

According to reports from Montreal, the Canadian Pacific has given a contract to the Algoma Steel Co. for 25,000 tons of 80-lb. rails. Contracts are also reported having been given for 3,000 tons by the Père Marquette and 4,000 by the Michigan Central, to be laid in Canada.

Announcement is made that the Southern Railway has given an order for 75,000 tons of rails to the Tennessee Coal & Iron Co. It is also reported tnat orders for rails have been given by the Pennsylvania Railroad for its lines east and west of Pittsburg for the year 1905, amounting to 102,700 tons, as follows: United States Steel Corporation, 55,500 tons; Lackawanna Steel Company, 7,000; Cambria Steel Company, 20,100, and Pennsylvania Steel Company, 20,100. The quantity ordered is about one-half of that ordered for 1904.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Franklin Institute.

At a meeting of the sections held December 22 in Philadelphia, the program included a paper on "Blast-Furnace Practice," by Edward A. Uehling, New York.

Canadian Society of Civil Engineers.

At the meeting of this society in Montreal December 22, a paper on "Loss of Heat from Iron Pipes" was presented, and one on "Bridge Launching," by B. J. Forest.

American Society of Civil Engineers.

At the meeting of this society in New York December 21, a paper on "The Reclamation of River Deltas and Salt Marshes" by J. Francis Le Baron, printed in the November proceedings, was presented for discussion.

PERSONAL.

—Mr. W. J. Schlacks, who has recently been appointed Superintendent of Machinery of the Colorado Midland, succeeding J. R. Groves, resigned, was born in 1874. Mr. Schlacks had his first railroad experience in

the Illinois Central shops at Weldon. In 1893, he became an apprentice in the Burnside shops, near Chicago, and completed his apprenticeship in 1895 in the Denver & Rio Grande shops at Burnham. He then attended Stanford University. After leaving college, he became Assistant Mechanical Engineer of the Denver & Rio Grande, where he remained until 1900, when he entered the service of the Colorado Midland. With this company he successively held the positions of Mechanical Engineer and General Foreman at Colorado City, and has now been appointed Superintendent of Machinery.

—Mr. J. S. Douglas, the new Superintendent of the Evansville & Terre Haute at Evansville, Ind., began his railroad service on the New York, New Haven & Hartford in 1884, where he held various positions

until 1888. From that year until 1902 he worked as a despatcher on that road and the Iowa Central, the Evansville & Terre Haute, the Denver & Rio Grande and the Chicago & Alton. In the latter year he returned to the Evansville & Terre Haute as Trainmaster, from which position he is now promoted to be Superintendent at Evansville.

—Mr. M. D. Grover, General Counsel of the Great Northern, died in St. Paul, Minn., December 18, at the age of 62.

—Mr. E. W. Willard, formerly and for a number of years a Director of the Old Colony Railroad, died at his home near Newport, R. I., on December 14, at the age of 95.

—Mr. John McGee, a civil engineer, died recently at his home in Kingston, N. Y., at the age of 65. Mr. McGee was born at Black Lick, Pa., and was a graduate of Union College, Schenectady, in the class of '62, and was a member of the corps of engineers engaged during 1872-1876 in building the Oroya railroad under Henry Meiggs, in Peru, being resident engineer. He was engaged in the survey for the Atchison and other western roads, also the West Shore. For the past 20 years Mr. McGee has been engaged in the Argentine Republic. He returned to his home from South America about six weeks ago and has been in failing health since.

—Mr. George S. Rice, hitherto Deputy Chief Engineer of the New York Rapid Transit Commission, has been appointed Acting Chief Engineer, to succeed General William Barclay Parsons, who has resigned. Mr. Rice has been in the employ of the city of New York most of the time for 17 years, having been Deputy Chief Engineer of the Aqueduct Commission from 1887 until 1891. In the latter year he went to Boston, where he was Chief Engineer of the Transit Commission. Four years later he returned to New York and took part, with Gen. Parsons, in the preliminary work for the subway in New York. In 1900 he was appointed Deputy Chief Engineer of the Rapid Transit Commission.

—Mr. Ossian Doolittle Ashley, Vice-President of the Wabash Railroad, and formerly and for many years at the head of the company, died at his home in New York City on Friday, December 16, at the age of 83. Mr. Ashley had been ill for some time. He was born in Townsend, Vt. His great-grandfather fought at the battle of Bennington under General Stark, and his grandfather, Benjamin Doolittle, served under Washington. In 1835 Mr. Ashley engaged in the wholesale dry goods business, and after several years' experience became a member of the Boston Stock Exchange, where he was an active member until 1857, serving as President in 1856 and 1857. He then went to New York and became a member of the Stock Exchange. In 1875 he was interested in the reorganization of the Toledo, Wabash & Western, and since that time has been prominent in the management of the successive Wabash companies. In 1878 he was appointed Assistant to the President, and later was elected Assistant Secretary. In 1879 the Wabash was consolidated with the St. Louis, Kansas City & Northern, and the new company was the Wabash, St. Louis & Pacific; Mr. Ashley was elected Assistant Secretary, and later became Secretary and Treasurer. In 1884 he was active in the reorganization of the company and in 1887 was elected President of the Wabash Western. In 1889 he was chosen President of the Wabash, which office he held until, in 1901, he was elected Chairman of the Board of Directors. At the time of his death Mr. Ashley was a director in several other roads. He leaves a widow, three daughters and a son. The son is dean of the New York University Law School.

ELECTIONS AND APPOINTMENTS.

Bessemer & Lake Erie.—William A. Parker has been appointed Purchasing Agent, with headquarters at Pittsburg, Pa., succeeding J. M. Ritchie, deceased.

Birmingham & Atlantic.—J. F. Fleetwood, hitherto Auditor and General Freight and Passenger Agent, has been appointed Superintendent.

Chicago & Alton.—J. W. Blabon, hitherto Fourth Vice-President of the Great Northern, has been appointed Freight Traffic Manager of the C. & A.

J. L. McLean, Advertising Agent, has been appointed Milk Traffic Manager, with headquarters at Bloomington, Ill.

Chicago & Eastern Illinois.—See St. Louis & San Francisco.

Chicago Great Western.—J. E. Chisholm has been appointed Master Mechanic in charge of the Oelwein shops, succeeding R. M. Crosby.

Chicago, Rock Island & Pacific.—C. M. Jones, Trainmaster of the Mexico division, has been appointed Trainmaster of the Southern and Amarillo divisions, succeeding M. E. Sebree, promoted. Mr. Jones will be succeeded by C. Stevenson.

Chicago, St. Paul, Minneapolis & Omaha.—S. G. Strickland, Division Superintendent at Omaha, Neb., has been appointed General Superintendent, with headquarters at St. Paul, Minn., succeeding W. C. Winter, resigned.

Cincinnati & Muskingum Valley.—S. B. Robertson, hitherto Assistant Engineer of the Pennsylvania Company (Southwest System), has been appointed Superintendent of the C. & M. V., succeeding C. M. Bennett, resigned. (See Pennsylvania Company.)

Cincinnati, Hamilton & Dayton.—R. H. Bowren and H. E. Whittenberger, Superintendents of the First and Fourth divisions of the Denver & Rio Grande, have been appointed Superintendents of the North and South division and the Indianapolis & Springfield division respectively, succeeding S. B. Floeter and W. C. Shoemaker, resigned.

Cleveland, Cincinnati, Chicago & St. Louis.—See Missouri, Kansas & Texas.

Colorado Midland.—W. J. Schlacks, hitherto General Foreman, has been appointed Superintendent of Machinery, succeeding J. R. Groves, resigned. J. C. Vining, hitherto Superintendent of Transportation, has been appointed General Superintendent, a position just created.

El Paso-Northeastern.—W. R. Martin, General Manager, has resigned.

Erie.—C. H. Morrison has been appointed Signal Engineer of this company and its allied and controlled lines, reporting to the General Superintendents on Operation and Maintenance, and to the General Manager on all new construction, with headquarters at Jersey City, N. J.

Louisville & Nashville.—The office of Fourth Vice-President has been created, and G. E. Evans, General Manager, has been elected to fill the posotion, effective January 1. Mr. Evans will be succeeded as General Manager by B. M. Starks, Division Superintendent at Birmingham, Ala. H. L. Stone has been appointed General Counsel.

Georgia, Florida & Alabama.—E. O. Alston has been appointed General Freight and Passenger Agent, with headquarters at Bainbridge, Ga.

Great Northern.—B. Campbell, hitherto Assistant Traffic Director of the Southern Pacific, has been appointed Fourth Vice-President of the G. N., succeeding J. W. Blabon, resigned, effective about Jan. 1. (See Chicago & Alton.)

Mexican Central.—G. W. Jennings, Assistant Superintendent of Machinery, having resigned, the position has been abolished. The office of C. H. Burk, Master Mechanic of the Mexico division, has been transferred from Aguascalientes to Mexico. All reports formerly made to the Assistant Superintendent of Machinery will be made to the Master Mechanic of the Mexico division. R. H. Rutherford has been appointed Assistant Master Mechanic of the Mexico division, with office at Aguascalientes.

W. K. MacDougald, hitherto Assistant General Passenger Agent, has been appointed General Passenger Agent; and T. R. Ryan, hitherto General Agent at Chicago, has been appointed General Freight Agent.

Michigan R. R. Commission.—Theron W. Atwood has been reappointed Commissioner for two years from January 1, 1905.

Missouri, Kansas & Texas.—C. L. Hilleary, hitherto on the Big Four, has been appointed General Passenger Agent of the M., K. & T., succeeding George Morton, resigned.

H. O. Bowen has been appointed Master Car Builder, with headquarters at Sedalia, Mo., succeeding J. L. Wigton, resigned.

New York, Ontario & Western.—The Directors of this company are: J. P. Morgan, William Rockefeller, Charles S. Mellen, George Macculloch Miller, Charles F. Broker, P. Newton Barney, Frank W. Cheney, William Skinner, Thomas P. Fowler, Grant B. Schley, Charles S. Whelen, John B. Kerr and James E. Childs.

Pennsylvania Company.—C. M. Bennett, hitherto Superintendent of the Cincinnati & Muskingum Valley, has been appointed Inspector of Maintenance of Way of the Southwest System. (See Cincinnati & Muskingum Valley.)

Pittsburg, Shawmut & Northern.—Frank S. Smith, Vice-President and Assistant to the President, has been appointed Acting President, with office at New York, succeeding the late L. M. Johnson.

St. Louis & San Francisco.—Bryan Snyder, Passenger Traffic Manager, has resigned.

St. Louis, El Reno & Western.—T. L. Wolf, hitherto Auditor and Traffic Manager, has been appointed General Superintendent, with headquarters at Guthrie, Okla. T.

Southern Pacific.—B. Campbell, Assistant Traffic Director, has resigned. (See Great Northern.)

Tennessee Central.—W. N. McDonald, Engineer of Maintenance of Way, has resigned.

LOCOMOTIVE BUILDING.

The Atlantic Coast Line is having two engines built by the Baldwin Locomotive Works.

The Wabash Terminal Co. has ordered 50 locomotives from the American Locomotive Co.

The Louisville & Nashville is having 10 locomotives built at the Rogers Locomotive Works.

The New York Central & Hudson River has ordered 50 locomotives from the American Locomotive Co.

The Michigan Central is reported to have ordered about 30 locomotives from the American Locomotive Co.

The Chicago, St. Paul, Minneapolis & Omaha has ordered three freight, three switch and two transfer locomotives from the American Locomotive Co.

The Northern Pacific will probably purchase 25 Pacific type (4-6-2) locomotives from the American Locomotive Co. These locomotives will be similar to those recently built at the Schenectady Works.

The Erie has ordered two Baldwin balanced compound passenger locomotives

from the Baldwin Locomotive Works and one Cole balanced compound passenger and three Pacific type simple passenger engines from the American Locomotive Co.

The Bessemer & Lake Erie has ordered 10 consolidation (2-8-0) locomotives from the American Locomotive Co. These locomotives will weigh 205,000 lbs., with 183,000 lbs. on drivers; cylinders, 22 in. x 30 in.; diameter of drivers, 54 in.; straight-top boiler with a working steam pressure of 200 lbs.; 339 tubes 2¼ in. in diameter and 14 ft. 10 in. long; fire-box, 120 in. long x 40 in. wide; tank capacity, 7,000 gallons of water, and coal capacity, 13 tons. Special equipment includes: Westinghouse brakes, Keasby & Mattison boiler lagging, Lappin brake-shoes, Dressel 18-in. headlights, Ohio and Monitor injectors, Damascus journal bearings, U. S. piston rod and valve packings, Waycott trussed brake-beams, Leach sanding devices, Nathan triple sight-feed lubricators, Pittsburg Spring & Steel Co.'s springs, Ashton and Coale's safety valves, Latrobe tires, Compensating Valve Co.'s throttle valves and Westinghouse friction draft gear.

CAR BUILDING.

The Pittsburg & Lake Erie has ordered 1,000 steel coal cars from the Pressed Steel Car Co.

The Chesapeake & Ohio has ordered 500 steel freight cars from the Pressed Steel Car Co.

The Grand Trunk is having 1,000 freight cars built by the Mt. Vernon Car Manufcturing Co.

The Pittsburg Coal Company has ordered 2,000 steel gondolas from the American Car & Foundry Co.

The Michigan Central is said to have ordered 50 passenger coaches from the St. Louis Car Co.

The Louisville & Nashville is having 123 freight cars built at the West Detroit Works of the American Car & Foundry Co.

The Northern Pacific, as reported in our issue of November 18, has ordered 1,000 gondolas from the Pressed Steel Car Co.

The Louisville & Southern Indiana Traction Company has ordered five interurban cars from the American Car & Foundry Co.

The Detroit & Mackinac is reported to have placed orders for 17 passenger coaches, 200 box cars, 75 stock cars and 25 furniture cars.

The New York, Philadelphia & Norfolk is having 100 freight cars built at the McKees Rocks Works of the Pressed Steel Car Co.

The Alabama Great Southern has ordered 200 coke cars from the Western Steel Car & Foundry Co. Special equipment includes: American Steel Foundries' bolsters, Westinghouse brakes, Climax couplers, Miner draft rigging and McCord journal boxes.

The Lake Shore & Michigan Southern has ordered 1,500 box cars, American Railway Association dimensions, and 1,000 twin hopper steel coal cars of 100,000 lbs. capacity from the American Car & Foundry Co. The coal cars will weigh 36,000 lbs. and will measure 38 ft. long, 10 ft. 2½ in. wide and 8 ft. 2 in. high. Special equipment for both kinds of cars includes Diamond arch-bar trucks.

The Chesapeake & Ohio, as reported in our issue of December 2, has ordered 500 steel hopper cars of 100,000 lbs. capacity from the Pressed Steel Car Co., for January, 1905, delivery. These cars will weigh about 40,000 lbs., and measure 30 ft. 5 in. long and 9 ft. 6 in. wide, inside measurements; and 10 ft. high, from rail. The special equipment will include: Pressed Steel and Simplex bolsters, Pressed Steel brake beams, Corning brake shoes, Westinghouse air-brakes, Climax couplers, Miner draft rigging, arch-bar trucks and Pennsylvania Car Wheel Co.'s wheels.

The Illinois Central, as reported in our issue of December 16, is building two passenger coaches at its own shops. The coaches will weigh 94,000 lbs. and will be 61 ft. long over end sills, 9 ft. wide over side sills and 14 ft. 6 in. high from top of rail to top of roof. Special equipment includes: Janney-Buhoup couplers, Forsyth curtain fixtures, Pantasote curtain material, Hewitt brasses, Monarch brake-beams, Symington journal boxes and journal-box lids, Illinois Central doors and draft rigging, Baker heating system, Pintsch gas, Railway Steel-Spring Co.'s springs, Pullman standard wide vestibules and Illinois Central Standard paint.

The Delaware, Lackawanna & Western has ordered 200 refrigerator cars of 60,000 lbs. capacity from the South Baltimore Steel Car & Foundry Co., for March, 1905, delivery. These cars will weigh about 36,000 lbs., and measure 37 ft. long over end sills; 8 ft. 10 in. wide, over side sills; and 13 ft. ⅝ in. high, from top of rail to top or running boards, to be built of wood, with metal underframes. The special equipment will include: Commonwealth Steel Co.'s body bolsters and Simplex truck bolsters, Pennsylvania brake beams, Lappin brake shoes, Westinghouse automatic quick action air-brakes, Magnus Metal Co.'s brasses, Perfection door fastenings, La Flare doors, Miner tandem draft rigging, Woodman journal boxes, Sherwin-Williams Co.'s paint, Pittsburg Spring & Steel Co.'s springs and arch-bar trucks with Barber roller side bearings.

BRIDGE BUILDING.

ANNISTON, ALA.—A viaduct is to be built on Tenth street, for which funds are being raised by the residents.

ATLANTA, GA.—Local reports state that permission has been granted to the Southern to use Nelson street from Madison to Nelson street bridge on condition that a new bridge be built from Madison street to the west end of the present bridge.

BINGHAMTON, N. Y.—The Erie, local reports state, is having its engineers locate the site and make plans for building a bridge over the Shenango River and Front street to replace the present structure. It is to be a heavy steel bridge to carry four tracks.

CASTLEWOOD, S. DAK.—The County Commissioners, it is reported, are asking for plans, specifications and bids January 6 for building a 65-ft. steel span with a 30-ft. approach at one end over Sioux River. L. H. Forde is Commissioner.

CHARLESTON, W. VA.—An 800-ft. span of the suspension bridge over Elk River, which was built in 1852, connecting East and West Charleston, collapsed December 15, turning over as it fell, and carrying 20 or 30 persons and a number of teams to the ice, 50 ft. below. Two persons were killed and several others are supposed to have been carried under the ice and drowned.

CHICKASHA, IND. T.—According to local reports, the Rock Island is making surveys to locate the site for a new bridge over the South Canadian River near this place to replace the one carried away by floods last summer.

CINCINNATI, OHIO.—The Chesapeake & Ohio will put up a steel viaduct in connection with its track elevation, which will be a direct connection with the Cincinnati, Hamilton & Dayton. The structure will be about three-quarters of a mile long. A contract has been let to the American Bridge Co. at about $100,000.

CLEVELAND, OHIO.—According to reports, the city has under consideration the question of building two bridges. W. J. Springbone, President of the Board of Public Service.

DAYTON, OHIO.—Bids are wanted by William F. Miller, Clerk of the Board of Public Service, January 6, for building the steel superstructure of a bridge over the Great Miami River at Herman avenue, to consist of five spans ranging from 132 ft. to 189 ft. each in length, with a roadway of 20 ft. and two sidewalks each 6 ft. Louis Haas is President.

DULUTH, MINN.—Two railroad bridges are proposed to be built over the St. Louis river, one above the old St. Paul & Duluth structure and the other below it.

FREDERICTON, N. B.—Bids are being asked by the Department of Public Works for building the Monroe bridge at Nashwaak.

GREENSBURG, PA.—A new steel bridge is to be built over Big Sewickley Creek by the electric road which is building a line from Jennette to West Newton.

FULTON, MISS.—A bill has been introduced in the Lower House of Congress authorizing Itawamba County, Miss., to build a bridge over the Tombigbee River, near this place.

IONA, MICH.—A vote will be taken on the question of authorizing the building of a bridge to cost $25,000.

KANSAS CITY, MO.—The Senate Committee on Commerce has reported favorably on the bill authorizing the Kansas, Liberty & Excelsior Springs Railroad Co. to build a bridge over the Missouri River between Clay and Jackson counties.

KIMBERLY, WIS.—A bridge is proposed over the Fox River, to be built by the Kimberly & Clark Co.

LOUISIANA.—In the United States Senate on Dec. 13 a bill was introduced authorizing Caldwell Parish, La., to build a bridge over the Ouachita River.

MINNEAPOLIS, MINN.—A bill is before the United States Senate authorizing the city of Minneapolis to build a bridge over the Mississippi River.

MINNESOTA.—On Dec. 16 a bill was introduced in the Lower House of Congress authorizing a bridge over the Red River of the North from Marshall County, Minn., to Walsh County, N. Dak.

NEW HAVEN, CONN.—Local reports state that the New York, New Haven & Hartford, in addition to building about 11 steel overhead bridges as a part of its four-tracking of the cut in this city, will put up a single-track two-span bridge 113 ft. long on the Danbury branch at Winnipauk; a 630-ft. steel viaduct at Fall River, Mass.; a two-span single-track bridge 117 ft. long over the Norwalk river, at Norwalk; a two-track 70-ft. bridge at Stonington; a 50-ft. single-track bridge at Branchville, on the Danbury branch, and two bridges 200 and 125 ft. respectively, to be built at Collinsville, on the Northampton division.

OTTAWA, ONT.—The new owners of the New York & Ottawa, it is reported, will probably replace many of the wooden bridges on the road with iron structures.

OWEN SOUND, ONT.—A vote will be taken January 2 to raise $30,000 for building a steel bridge.

PORTLAND, ORE.—A bridge is proposed over the Cowlitz river between Kelso and Catlin to cost $10,000.

PRAIRIE DU CHIEN, WIS.—Local reports state that the Chicago, Milwaukee & St. Paul will build a railroad bridge next spring.

SMITHFIELD, N. C.—Bids, it is reported, are wanted January 3 by Johnson County Commissioners for building a steel bridge over Neuse River. W. A. Edgerton is Registrar of Deeds.

ST. JOHN, N. B.—The Canadian Pacific is considering the question of building a two-span bridge over St. John harbor.

UNIONTOWN, PA.—Local reports state that the Grand Jury has approved the finding of the viewers recommending the building of a bridge in Stewart township; also a bridge over Mill Run in Washington township.

UTICA, N. Y.—Plans for improvements under consideration provide for a bridge over the tracks at the foot of Genesee street and over the canal, railroad and river at the foot of Mohawk street; also for a one-span bridge over Bleecker street at the West Shore crossing.

WASHINGTON, D. C.—A bill has been offered in the Lower House of Congress to amend the act for the construction of a bridge over the Tennessee river at Marion, Tenn. The amendment provides that the act shall be void unless the work is commenced by January 1, 1906, and completed within three years.

WEST CHESTER, PA.—The County Commissioners will build a new bridge over the Brandwine at Lenape.

WINFIELD, KAN.—The Atchison, Topeka & Santa Fe, it is reported, has commenced work on a new steel bridge over Walnut Creek.

WINNIPEG, MAN.—The government will be petitioned to pay a share of the cost of building a large steel bridge over the Red River from North Winnipeg to Kildonan, to cost about $75,000.

YANKTON, S. DAK.—A bill has been introduced in the United States Senate extending the time for the completion of the bridge at Yankton, S. Dak.

Other Structures.

ANNAPOLIS, MD.—Bids have been opened at the Navy Department for the construction of a naval hospital at the U. S. Naval Academy at Annapolis. The lowest bid was that of the General Supply & Construction Co., of New York, at $180,925. The other bids were: John Pierce, of New York, $200,000; John Gill & Sons, of Cleveland, $202,000; Charles McCall, of Philadelphia, $184,905; Edgar M. Noel, of Baltimore, $202,000, and John C. Robinson, of Chicago, $198,906.

ASBURY PARK, N. J.—The City Council has given a franchise to Jesse W. Starr, formerly of Camden, to build a steel pier 800 ft. long to cost $400,000, at the foot of Eighth avenue.

COVINGTON, KY.—The Chesapeake & Ohio, it is reported, will put up a three-story building for offices.

GREENVILLE, S. C.—Excavation work has been commenced on the new Southern passenger station by J. F. Grandy & Son, of this place, the contractors.

GUADALAJARA, MEX.—The Mexican Central is reported to have bought ground and has plans ready for building a new hospital at a cost of about $30,000. E. S. Banks is Division Superintendent.

LANCASTER, N. Y.—Local reports state that the Lehigh Valley has bought land east of this place, on which it will put up a large coal trestle. The plans call for a covered shed 230 ft. x 480 ft. Bids have been let for the foundation work. The cost of the whole will be about $100,000.

LIMA, OHIO.—The Cincinnati, Hamilton & Dayton, according to local reports, will spend several hundred thousand dollars in improvements to its shops at this place and increase the capacity of the roundhouse from 16 to 32 stalls.

LOUISVILLE, KY.—The Louisville & Nashville, local reports state, has decided to build a 10-story steel building 60 x 200 ft. at Ninth street and Broadway, to hold the general offices of the company, to cost between $300,000 and $400,000. Plans are being made and work will be commenced early in the spring.

MEXICO, MO.—The Chicago & Alton, the Wabash and the Chicago, Burlington & Quincy are planning to build a union passenger station here.

MUSKEGON, MICH.—The Pere Marquette, reports say, is remodeling its machine shop at this place to increase its capacity.

NEW ORLEANS, LA.—Bids, it is reported, for the improvements at Chalmette street for the St. Louis & San Francisco have all been rejected. New bids are to be opened December 28 for this work, which includes the construction of freight sheds, a large slip and some excavation work.

NEWPORT, ARK.—A contract, it is reported, has been given by the St. Louis, Iron Mountain & Southern at $15,000 to T. H. Busey, of St. Louis, for building a new passenger station 40 x 200 ft.

TRURO, N. S.—The Intercolonial, it is reported, has given a contract to Rhodes, Curry & Co., Ltd., for building a new roundhouse to cost about $110,000.

UTICA, N. Y.—A special committee is to be appointed to confer with the New York Central, the New York, Ontario & Western and the Delaware, Lackawanna & Western to secure the building of a union passenger station.

WELLINGTON, KAN.—Surveys, it is reported, have been made and plans completed for building a 10-stall addition to the Atchison roundhouse. A new storehouse is also to be put up.

WEST FRANKFORD, ILL.—The Chicago & Eastern Illinois will build, with its own forces, a small yard to include a Y, a cinder pit, engine shed and water tank.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTA & GULF.—Application has been made by this company in Georgia for a charter with power to build a railroad about 400 miles long from Atlanta, Ga., southwest through Fulton, Campbell, Douglas and Heard counties to the Georgia state line and thence southwest to the Gulf of Mexico. F. A. Kuhn, J. J. McClendon, T. H. Goodwin, J. R. Bradbury and others, of Atlanta, Ga., are interested.

CALGARY, RED DEER AND BATTLEFORD.—Incorporation is being asked by this company from the Dominion Parliament with power to build a railroad from Calgary to Battleford. McGivern and Haydon, Ottawa, Ont., are acting for the promoters.

COLORADO, OKLAHOMA & SOUTHEASTERN.—An officer writes that location surveys have been completed for this proposed road from Weatherford, Okla. T., through Independence, Putnam, Verona, Hackberry and Detroit to Woodward, 85 miles. P. A. McCarthy, Lufkin, Tex., is Chief Engineer. (May 20, p. 391.)

CONWAY, COAST & WESTERN.—The proposed route of this road is from Sumter, S. C., east to Conway, 75 miles, with a branch line from Britton's Neck north to Marion, about 20 miles. It is the intention of the company eventually to extend the line from Conway east to Southport, 50 miles. This company was organized to take over the Conway Seacoast Railroad, which operated a line from Conway southeast to Myrtle Beach. Surveys have been finished from Conway west to Cool Springs, 12 miles, and grading on this portion of the line is in progress. Location surveys are also in progress from Cool Springs to Britton's Neck, four miles. Connection will be made with the Atlantic Coast Line and the Southern at Sumter and with the Atlantic Coast Line and Caroline Northern at Marion. F. A. Burrows, Conway, S. C., is President, and R. E. Beatty, Chief Engineer. (September 9, p. 86.)

DES MOINES, IOWA FALLS & NORTHERN.—At the annual meeting of the stockholders of this company, held at Iowa Falls, Iowa, December 13, a resolution was adopted directing an extension of the line in a northerly direction next spring. The selection of the route was left to the board of directors. Charles City and Mason City are both being considered for the terminus of this extension.

DULUTH, MISSABE & NORTHERN.—An officer writes confirming the report that a contract has been let to Winston Bros., of Minneapolis, for building an eight-mile cut-off from a point on the main line near Shaw, Minn., to Scott. The new line will avoid the heavy grades in the vicinity of Hibbing. (December 2, p. 177.)

EASTERN WASHINGTON.—This company has been incorporated in Washington to build a railroad from Fletcher to Connell, 35 miles. The authorized capital is $200,000. E. W. Swanson, Spokane, Wash., and W. S. Foster, Cheney, Wash., are interested. Surveys have already been finished and it is stated that grading will be begun early in the spring.

GUTHRIE, FAIRVIEW & WESTERN.—Bids will be received by this company until January 20 for grading certain sections of this proposed road between Guthrie, Okla. T., and Fairview, 70 miles. The contracts will be let as follows: From Darrow to Fairview Junction, from Darrow ten miles west towards Cantonement, from Darrow to Keil and for that portion of the company's line in Guthrie on Seventh street south of Cottonwood Creek, and from Sixth street to where the line connects with the Atchison, Topeka & Santa Fe. W. S. McCaull, Guthrie, Okla. T., is President, and G. C. Cowels, Kansas City, Mo., is Chief Engineer. (October 28, p. 139.)

HUTCHINSON & WESTERN (ELECTRIC).—Incorporation has been granted this company in Minnesota to build an electric railroad from Hutchinson west through the counties of McLeod, Meeker and Kandiyohi. E. L. McGrory, W. E. Ellis, Z. A. White and E. H. Bass are incorporators.

KANSAS RAILROAD.—A charter has been granted this company in Kansas with an authorized capital of $2,000,000. It is proposed to build a railroad from a point on the Missouri State line through Crawford, Neosho, Wilson, Elk, Butler and other counties to the Oklahoma State line. T. J. Hudson, T. F. C. Dodd and T. C. Babb, all of Fredonia, Kan., are incorporators.

LACKAWANNA, WYOMING VALLEY & WESTERN.—Application has been made by this company for a charter to build a third-rail line 20 miles long from Wilkesbarre, Pa., to Nanticoke and West Pittston. This line will be a continuation of the Lackawanna & Wyoming Valley, which runs from Wilkesbarre northeast to Carbondale. A full description of this latter railroad was given in our issue of April 22, page 300. S. R. Ketcham, of Philadelphia, and B. K. Focht, Lewisburg, Pa., are among the promoters.

LOUISIANA ROADS.—Press reports state that the Crowell & Spencer Lumber Co., of Longleaf, La., has let a contract to W. E. Wilburn, Andrew, La., for building a standard-gage railroad from Longleaf to Lecompte. 12 miles. Grading is now in progress and the contract calls for the completion of the line by August 1, 1905.

MANISTEE & GRAND RAPIDS.—An officer writes that work is now in progress from the present terminus of this road to Marvin, 6½ miles. B. F. Brucker, Saginaw, Mich., is the contractor.

MEXICAN ROADS.—A concession has been granted to Davis Richardson to build a standard-gage railroad in the state of Sonora from Guaymas, on the Gulf of California, along the Yaqui River through the Dura mining district to Tonichi. According to the terms of the concession, surveys must be begun within six months.

MIDLAND VALLEY.—Press reports state that work, which was temporarily suspended on this road, has been resumed. The line is being built from Muskogee, Ind. T., northwest to Tulsa, 60 miles, and about 20 miles have already been graded out of Tulsa. F. A. Molitor, Fort Smith, Ark., is Chief Engineer and General Manager. (May 20, p. 392.)

ST. LOUIS & NORTHEASTERN.—Incorporation has been granted this company in Illinois to build a railroad from Edwardsville southwest to East St. Louis, 18 miles. W. B. McKinley, B. R. Stephenson, H. J. Pepper and S. A. Power, of Champaign, Ill., are incorporators.

ST. MARY'S & WESTERN ONTARIO.—A charter is being asked from the Dominion Parliament with power to build a railroad from the C. P. R. between Woodstock and London, Ont., to a point near Grand Bend or Sarnia, Ont. J. W. Graham, St. Mary's, Ont., may be addressed.

SANTA FE, PRESCOTT & PHOENIX.—Press reports state that a contract has been let for building a branch line from Congress Junction, Ariz., west for a distance of 40 miles to the Colorado river. Location surveys for this line were completed some time ago.

SHEFFIELD RAILROAD.—Articles of incorporation have been filed by this company in Alabama to build an interurban electric line 10 miles long connecting Sheffield, Florence and Tuscumbia. George Parsons, Henry Parsons and J. W. Worthington, all of Tuscumbia, Ala., are incorporators.

SOMERSET RAILROAD.—Press reports state that a contract has been let to J. S. Kaulback & Co. for building an extension nine miles long from Austin Deadwater, Me., to the head of Moxie Pond. This extension, when completed, will bring the main line of the railroad within 20 miles of the Canadian Pacific. The contract calls for the completion of the line by September, 1905. The work includes 110 acres of clearing, 70,000 cu. yds. of earth excavation, 9,000 cu. yds. of loose rock, 12,000 cu. yds. of solid rock, 200,000 ft. of timber culverts and 800 ft. of pile bridges. W. M. Ayer, Oakland, Me., is Manager, and J. F. Hill, Bingham, Me., is Chief Engineer. (November 11, p. 151.)

UNION & GLEN SPRINGS.—An officer writes that work is now in progress on this road from a point on the Seaboard Air Line near Carlisle, S. C., to Union, 17 miles. W. J. Oliver, Knoxville, Tenn., is the contractor. Preliminary surveys are in progress for a branch line from Buffalo, S. C., to Spartanburg, 25 miles. G. M. W. Wright, Union, S. C., is General Manager. (See Construction Supplement.)

WINKLE, HOUSTON & ST. LOUIS.—Incorporation has been granted this company in Illinois to build a railroad from Winkle, Perry County, west to Houston, Randolph County, 20 miles. C. A. Lyle, H. C. Rutledge, A. J. Davis and others, of Winkle, Ill., are incorporators.

RAILROAD CORPORATION NEWS.

BUFFALO & SUSQUEHANNA RAILWAY.—Fisk & Robinson, New York, are offering at 101 and interest the unsold portion of $5,000,000 4½ per cent. gold bonds dated April 1, 1903, and due April 1, 1953. The bonds are secured by deposit with the United States Trust Co., of New York, of the entire common stock of the Buffalo & Susquehanna Railroad, and a first-mortgage on the terminal property at Buffalo; also on the line now in course of construction from Wellsville, N. Y., to Buffalo, 84 miles. A pamphlet has been issued describing the property and showing the location of the coal and coke properties which the extended road will bring into close connection with Buffalo.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—This company has made arrangements with the Hocking Valley for trackage rights for its freight trains between Carey, Ohio, and Toledo, 50 miles. The company's passenger trains have for some time past had trackage rights over this line.

COLORADO & SOUTHERN.—This company has bought the Colorado Springs & Cripple Creek District Railroad, which runs from Colorado Springs, Colo., to Cripple Creek, 46 miles, with branches and spurs aggregating a total length of 75 miles..

CONEY ISLAND & BROOKLYN.—The New York State Railroad Commission has granted the application of this company to issue $10,000,000 bonds. The condition made is that but $5,000,000 may be issued at this time and that a new application must be made before the remaining portion is issued.

DES MOINES & FORT DODGE.—Mason, Lewis & Co. are offering at 98 and interest $250,000 new first-mortgage gold bonds. The bonds are guaranteed principal and interest by the Minneapolis & St. Louis.

LOUISVILLE & NASHVILLE.—At a meeting of the directors on December 15, a semi-annual dividend of 3 per cent. was declared payable February 10 to holders of record January 23. This places the stock of the company on a 6 per cent. basis. The road heretofore has paid 5 per cent. annually.

NEW YORK, NEW HAVEN & HARTFORD.—This company has purchased the Pittsfield & Stockbridge and Berkshire railroads. These railroads have heretofore been operated under a lease of 99 years, the company paying 6 per cent. on the stock. They are both parts of the main line of the Berkshire division; the Pittsfield & Stockbridge runs from Vandeusenville to Pittsfield, Mass., and the Berkshire Railroad from Canaan, Conn., to the New York State line, each about 22 miles long.

ST. LOUIS & SAN FRANCISCO.—Redmond & Co., New York, are offering on a 5½ per cent. interest basis $1,000,000 St. Louis and San Francisco 4½ per cent. gold coupon notes. These notes are a direct obligation of the St. L. & S. F. and are secured by a deposit of first mortgage bonds of the St. L., S. F. & N. O. Railroad, which makes the issue practically a first lien on 223 miles of road. The St. Louis & San Francisco is controlled by the Chicago, Rock Island & Pacific, which has issued $17,180,940 of its 5 per cent. bonds in acquiring the property, which bonds are secured by the common stock of the St. L. & S. F.

UNITED RAILWAYS (ST. LOUIS).—F. S. Smithers & Co. and Spencer Trask & Co., of New York, in connection with the Mercantile Trust Company, of St. Louis, are making joint offerings at 87 and accrued interest of $2,877,000 general first mortgage 4 per cent. gold bonds of the United Railways Company of St. Louis. This company owns about 340 miles and leases about two and a half miles of street railroad in the city of St. Louis and its vicinity. The general first mortgage 4 per cent. bonds are secured by a direct mortgage on all of the company's mileage, subject to $13,688,000 underlying liens (for the retirement of which an equal amount of the general first mortgage bonds is reserved), and also on all the stocks of the constituent companies.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, DECEMBER 23, 1904.

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